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The Chemical Age

A Weekly Journal Devoted to Industrial & Engineering Chemistry

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NOTICES:—All communications relating to editorial matter should be addressed to the Editor, who will be pleased to consider articles or contributions dealing with modern chemical developments or suggestions bearing upon the advancement of the chemical industry in this country. Other communications relating to advertisements or general matters should be addressed to the Manager.

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Lessons from Germany

THE discussion on the organisation of German chemical industry, at the meeting of the London Section of the Society of Chemical Industry on Monday evening, filtered down in the end to one final conclusion, stated in clear terms by Dr. Walpole. "The picture," he said, "conjured up by the German chemical industry to-day is team work in its highest development. . . . . The whole issue will depend upon the collective action of the big chemical interests in this country and upon their 'staff work.' If they get together and develop on lines of mutual help and support, we can stand up to the great organisations with which we shall have to compete." The point was emphasised later by Dr. Ormandy, who warned the members that if British chemical firms continue to adhere to the system of working in small detached units, it is only a question of time before Germany gets back her supremacy, not only in the chemical industry, but in the iron and steel industries. Unfortunately, with this single exception, this fundamental point was almost wholly ignored in the discussion. Even in the official abstracts, published in the following morning's papers, the sentences in which Dr. Walpole summed up the whole situation did not appear, and we have taken the liberty of supplementing the official report on this vital point, for, without the addition, the report of the addresses and the discussion somewhat resembles an inquest without the verdict. If it be really true that the future of the British chemical industry depends on whether our great firms take collective action or not, it is a matter of the utmost interest to know whether they are preparing to take such action, and if so in what form and to what extent. One could name, say, half-a-dozen concerns who could decide this main issue almost at once. Taken alone, their organisation compares well with the best that Germany can show; the essential difference is that they act alone and not together. Individual excellence, however, is not enough by itself; it needs to be supplemented by effective "team work," and how that is to be brought about no one at present appears to know. That is the weak point in the British position. The defect is recognised; but no steps are being taken to repair it. And if the present easy policy of inaction continues, we may live to see Dr. Ormandy's prophecy realised.

Mr. E. V. Evans's Paper at the same meeting was largely concerned with the position of the British dye industry. We had hoped to hear Mr. Evans deal directly with the important question of the manufacture of intermediates, to which considerable attention has been given in our columns recently, for his experience in this matter is large and specialised, and his judgment carries corresponding weight. He did, indeed, deal with it, but indirectly. His case seems to be that there is no insuperable chemical difficulty in discovering how German products are made or in producing them in this country; the difficulty lies in inducing British firms to undertake the large expenditure necessary in the absence of adequate guarantees as to the future. Germany, as the result of 40 years' work, had attained before the war a position which enabled it to produce 80 per cent. of the world's dye requirements; that huge organisation still exists, though for the moment in a state of partial inaction, and in addition Great Britain, Switzerland, America and France are contemplating a vast extension of their dye-producing capacity. These conditions point to the possibility of over-stocked markets, or to a state at least of equilibrium between the producing countries. If, as we have before pointed out, it is essential that this country should have its own dye-producing organisation, the Government, treating the matter as a national interest, must do its part towards creating and safeguarding an essential "key" industry. This

is a very different thing from Protection in the ordinary political sense. It is merely co-operation between the Government and private industry in giving British commercial enterprise a fair start and a fair chance. Mr. Evans's view appears to be that once reasonably secure conditions are guaranteed for the investment of British capital, British commercial firms may be trusted to do the rest.

Though these may be considered the outstanding points in the evening's discussion, there were others which certainly ought not to be overlooked. Perhaps the most important was Mr. Evans's reminder that the future will lie, not with the country which most successfully repeats already known processes, but with the country which discovers new lines of progress. In other words, all the nations are starting from a new point, and the country which puts most faith in research and spends money most freely on it must secure the lead. Another point on which the chemist speaks with feeling is the subordinate place he too often holds in the management of works. In Germany and other countries the managing director of chemical works is usually himself a trained chemist with first-hand knowledge of the processes employed, and the capacity of judging for himself of the work of the chemical staff. Here that is by no means always the case, and the effect is a little depressing on the chemical work. A third point is the serious and often costly effort made by Germany to attain the highest degree of purity with the lowest working costs. It is beside the question to say we can do it just as well or even better if we like to try. That is the essential point of distinction. Germany has thought it worth while, and has reaped the commercial reward. Too often we have not thought it worth while, and have paid the inevitable penalty.

The Endowment of Science

LAST week we referred to the appeal for £150,000, which is being made on behalf of the Manchester College of Technology. This is now followed by a larger appeal for half a million on behalf of the University of Manchester. Both are of interest to all engaged in chemical science and industry, because both institutions are very directly concerned in chemical studies. Already a sum of nearly £100,000 has been raised for the University, and in addition a group of firms has contributed £10,000 towards the foundation of a Chair of Colloid Chemistry. As we reminded our readers last week, and as Professor Ramsay Muir now points out, the Owens College has been most remarkable for its work in the field of the natural sciences, and especially in chemistry. "Frankland, Roscoe, Schorlemmer, and their fellows created what was practically the first great organised school of chemistry in this country, and the debt which chemical science and chemical industry owe to their labours cannot easily be measured." In the first list of subscriptions the textile firms of Lancashire are well represented; the great chemical firms are not so conspicuous, though their future depends on the application of science to industry at least as much as that of the textile or any other industry. Indeed, the future of the country depends on it, and we shall have missed one great lesson of the war if it is not more fully realised. The only comment we have heard on recent appeals is that the sum asked for is not large enough to correspond with the needs or to impress the public imagination. Professor Muir has the courage to say so. "The sum named," he says—half a million in this case—"is far too small. For so great a purpose at least four times as much should have been demanded."

Professor Muir does well to apply the spur in the shape of a reminder of what Germany did before the war and of what the United States is doing now on an ever-expanding scale. "Before the war," he writes, "men who wanted to be trained in the methods of research flocked to Germany. They went in hundreds, from our own country, from the Dominions, and from America; and it is impossible to over-estimate the prestige and the influence which Germany derived from this fact. The war has stopped the stream; and now hundreds of men are asking why England, with her long tradition of learning, should not be able to give this kind of training. . . In America, where Universities are already endowed on a scale inconceivably more lavish than anything we are accustomed to, almost all the Universities are now appealing for additional funds. But only the smallest among them put their claim so low as half a million sterling; the greater Universities ask for millions. And they get it; because America realises that in the new age public welfare depends upon organised learning as much as upon any other factor. America, it may be said, is rich with the spoils of the war; and that is true. But there are many men in England whom the war has made rich, sometimes almost in spite of themselves. Are there not some among them who would be fascinated by the opportunity of taking a part in giving a new and wider and fuller meaning to the name University; of building, upon foundations already soundly laid, a great centre of sober and fearless learning in the very heart of the vast industrial area upon which our national future largely depends, a centre of learning in intimate contact with the modern industrial civilisation, yet loyal to the traditions of the past, training our best young minds to study and to understand the fascinating and intertwined problems of the new age? It would be a glorious enterprise for any man to devote a solid million to this end, to spend his thought as well as his money, to take counsel with the best men already at work, to build with imagination for the future, to help to lay solidly the foundations of the nobler England that is to come."

The professor mentions one million, but even that seems trifling beside Mr. J. D. Rockefeller's Christmas gift, just announced, of one hundred million dollars for the endowment of education and science in America—more than, at the present rate of exchange, £25,000,000. This mammoth donation is to be devoted to two purposes—(1) to some plan of increasing the salaries of the teaching staffs of the colleges and universities of the United States; (2) to the promotion of the objects of the Rockefeller Foundation. American Universities have felt so keenly the need of better payment for their teaching staffs that many of them have been obliged to seek additional endowment this winter. Harvard and Princeton are both now appealing to the public

for $15,000,000, while the Women's University at Bryn Mawr, near Philadelphia, is asking for $1,000,000. Only a few months ago the Rockefeller Foundation allocated $25,000,000 for medical studies and research. Beside all this, the half-million the Manchester University is asking for seems almost insignificant. Whether our wealthy commercial men realise it or not, one thing is certain—the future belongs to the nation which spends most wisely and most lavishly on its educational equipment, and the truth cannot be too insistently pressed on the State, and especially on our princes of industry.

A Chemical Trade Directory

WE have received from the Association of British Chemical Manufacturers a copy of their "official directory of members, with a classified list of their manufactures." The Association, whose membership is entirely composed of bona fide British manufacturers of chemical products, is established to give purchasers in all parts of the world a guarantee of manufacture, to promote and facilitate business relations between manufacturing and chemical firms and purchasers all over the world, and to encourage legitimate international trade conditions; and this directory is one very valuable means of attaining these ends. It comprises a list of the Council, honorary members, and officers of the Association, a complete directory of members, a classified list of products and manufactures, and a list of proprietary and trade names. This information is the more valuable on account of its being printed in seven languages—English, French, Spanish, Italian, Portuguese, Russian and Japanese—in itself evidence of the international character of chemical commerce. The various sections are well arranged, and full details are given of postal and telegraph addresses, telephone numbers, telegraphic codes, &c., and the goods in which each firm deals. Such a volume would seem to be indispensable to the chemical manufacturer, and to be extremely useful, not only to British commercial attachés, Consular officers and trade commissioners, but to the various Government purchasing departments throughout the world. An assurance is given to purchasers that goods ordered by them are actually produced by the firm in question, together with an invitation for suggestions as to new and varied products. The directory is issued from the Association's address: 166, Piccadilly, W. 1, and the price is 10s. 6d. The first edition consists of 8,000 copies.

Chemical Supplies for Russia

WE are informed by a Reuter message from Copenhagen, dated January 6, that Mr. O'Grady, M.P., is of opinion that an agreement may shortly be possible between Great Britain and Soviet Russia. For the present M. Litvinoff is despatching to his Government a small consignment of drugs which he has been able to obtain, and which are apparently exceedingly scarce in Russia. Larger quantities of drugs, it is stated, will go to the Soviet Government with subsequent consignments, and estimates are understood to have been invited from British manufacturers. This points to the possibility of a gradual resumption of trading relations with Russia, and British chemical firms would be well advised to keep an eye on the openings in Russia for business, both in drugs and in heavy chemicals. Agricultural implements are understood to be greatly needed, and with the restoration of the agricultural industry there should be a large market for fertilisers.

The Calendar

Jan.		
12	Royal Geographical Society: "Geographical Reconnaissance by Aeroplane Photography." Paper by Capt. H. Thomas. 5 p.m.	Lowther Lodge, Kensington Gore, London, W.
13	Royal Institution of Great Britain: "Modern Development of the Miner's Safety Lamp." Paper by Sir John Cadman. 3 p.m.	Royal Institution, 21, Albemarle Street, London, W.
13	Royal Photographic Society and the Röntgen Society: "Some Aspects of Radiology." Discussion by Major G. W. C. Kaye and others. 7 p.m.	35, Russell Square, London.
13	Society of Chemical Industry (Edinburgh & East of Scotland Section): Informal Meeting.	Edinburgh.
13	Sheffield Association of Metallurgists and Metallurgical Chemists: "The Properties of Metal revealed by the Ball Test." T. F. Russell, Assoc. Met. 7.30 p.m.	Assembly Room, Royal Victoria Hotel, Sheffield.
14	Faraday Society, Royal Microscopical Society, Optical Society and Photomicrographic Society, in co-operation with the Optical Committee of the British Science Guild: "The Microscope: Its Design, Construction and Applications." Symposium and discussion, 4.30 and 8 p.m., Exhibition, 2.30 p.m.	Royal Society, Burlington House, Piccadilly, London, W.1.
15	Association of Engineering and Shipbuilding Draughtsmen (Chesterfield Sub-Branch, Technical Section): "Gas Cylinders." Frank S. Marsh, M.Sc. (Leeds), B.Sc. (London). 7.30.	Grammar School, Chesterfield.
15	Society of Dyers and Colourists, (Bradford Junior Branch): "Utility of General Science to the Dyer." Dr. L. L. Lloyd.	Bradford.
15	Chemical Society: Ordinary Scientific Meeting. Papers by L. E. Hinkel and H. W. Cremer, G. S. Butler and H. B. Dunnicliff, M. Nierenstein, C. W. Spiers and the late K. C. R. Daniel, R. Lessing, P. Ray and P. V. Sarkar. 8 p.m.	Burlington House, Piccadilly, London, W.1.
16	Royal Institution of Great Britain: "Low Temperature Studies." Prof. Sir James Dewar. 9 p.m.	Royal Institution, 21, Albemarle Street, London, W.
16	West of Scotland Iron and Steel Institute: "The Efficiency of Refractory Materials." Prof. Fernsides. 7	Royal Technical College, Glasgow.
16	Society of Dyers and Colourists (Manchester Section): "Sulphonation of Fixed Oils." L. G. Radcliffe, Miss E. Bramwell and S. Medofski.	Manchester.
20	Manchester Municipal College of Technology, (Dept. of Applied Chemistry): "Extraction Plant and Methods." H. J. Pooley. 4.30 p.m.	Manchester.
22	Society of Dyers and Colourists (West Riding Section): "The Application of Electricity in the Dyeing Industry." F. Mollwo Perkin.	Bradford.

Manufacture of Ammonium Sulphate from Gypsum

By D. H. B. Wride, M.Sc., A.I.C.

The following article claims to show that the conversion of gypsum into ammonium sulphate is neither a very difficult nor an expensive operation. With the rapidly growing demand for ammonium sulphate for fertilisers, which is far in advance of the present output from gas works, coke ovens, &c., the utilisation of gypsum in connection with some form of synthetic ammonia process seems worthy of consideration, especially as the necessary raw materials (coal and gypsum) are readily available.

THE use of gypsum as a source of SO_4 ions has received a considerable amount of attention during the last few years, particularly in the sulphuric acid industry, where attempts have been made to transfer the sulphuric acid content of gypsum into a more available form. B.P. 124,842 (1919) deals with this subject. In this process gypsum is converted into ammonium sulphate by passing CO_2 and NH_3 up a tower down which the mixture of gypsum and water is being pumped. The sludge is circulated up and down the tower until the whole of the gypsum has been converted into ammonium sulphate, after which the latter is filtered off, evaporated and dried. It is then mixed with iron oxide in a rotary furnace where NH_3 is given off and ferric sulphate formed. This is then decomposed in a suitable furnace into SO_3 and iron oxide, the SO_3 being absorbed in sulphuric acid and the iron oxide returned to the cycle to decompose some fresh ammonium sulphate.

The nature of the process is shown in Fig. 1. As far back

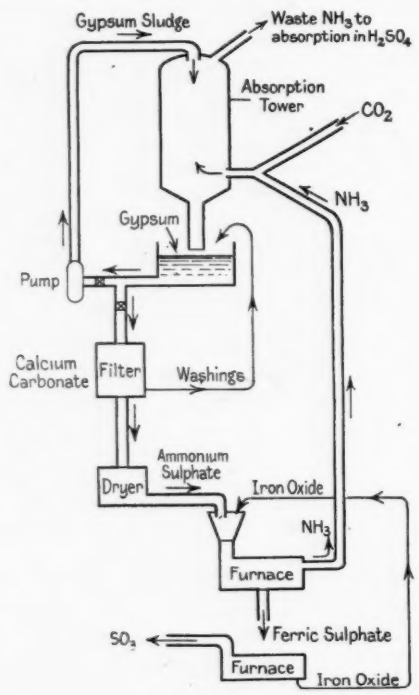


FIG. 1.

as 1888 a process was patented wherein coal-tar was warmed with gypsum and water, ammonium sulphate being thereby formed, though the chief aim of the process was not the formation of this salt, but the purification of the coal-tar.

During the war especial attention has been paid to the use of gypsum in the formation of ammonium sulphate for fertilisers, and as the chief advances in the industrial development of synthetic ammonia were carried out in Germany, it is natural that the use of gypsum in this connection should have been chiefly studied in that country also. The process has not been fully described, but it is believed to have been made to work quite successfully on a manufacturing scale. It depends on the reaction—

$$CaSO_4+(NH_4)_2CO_3=CaCO_3+(NH_4)_2SO_4.$$

and the raw materials used are, gypsum, carbon di-oxide and ammonia.

In a synthetic ammonia process such as the Haber, the last two materials are available in abundance, the CO_2 being a by-product from the hydrogen plant, and it is in connection with the Haber process that the use of gypsum in this manner has been more particularly intended.

The process is of quite a simple nature. Finely-ground gypsum is well stirred up and suspended in either (i.) water, or (ii.) an aqueous solution of ammonia, and either (i.) NH_3 and CO_2, or (ii.) CO_2 alone is led into the suspension. The $CaCO_3$ formed is filtered off from the solution of ammonium sulphate, which is then concentrated and the salt crystallised out.

As the reaction is an exothermic one, it should be carried out at as low a temperature as possible; not only will this help the reaction to be carried to completion, but it will also reduce the loss of ammonia due to evaporation. Hence it would seem that on large scale working some system of cooling coils will be necessary.

B.P. 27,962 (1913) taken out by the Badische Co. deals with this process, and great stress is laid on the fact that the chief difficulty is one of filtration, as the calcium carbonate tends to cake into a very hard mass and thus requires a large amount of washing. This, of course, means more solution to be evaporated and a considerable increase in the steam consumption and the cost of the finished product. The type of filter recommended is similar to that used in the extraction of gold ores, and consists of a shallow iron box with perforated sides, these being covered with some kind of filtering cloth. The box is connected to a vacuum plant and is dipped into the liquid to be filtered, a slight negative pressure being maintained inside the box. When filtration and washing is complete, the cake of chalk can be removed by blowing air into the box.

It is claimed that with this type of filter a uniform and coherent layer of precipitate is formed, which does not crack or drop off and which can, therefore, be rapidly and thoroughly washed. It appears that this filtration difficulty is due to the presence of silica and alumina in the gypsum, which results in the formation of a very sticky and gelatinous sludge.

Another difficulty in the process is the fact that the plant soon gets encrusted with a hard deposit of chalk or gypsum, with the consequent necessity of frequent cleaning. This effect appears to be greatly diminished by the use of vessels of ample proportions, and by ensuring that the CO_2 and NH_3 are led in at the centre, so that the reaction takes place in the liquid medium well away from the walls of the vessel. Volume III. of the "Memoirs of the Geological Survey" deals with the gypsum deposits in this country, and it appears that we possess an enormous amount of gypsum of very high quality and from analyses given, of a low silica and alumina content. These beds occur largely in Westmoreland and Cumberland and in the Derbyshire districts, all of which are within easy reach of our coalfields and centres of chemical industry, and may well be a useful source of raw material should this process be developed in

this country in the future. The average pre-war cost of unground gypsum was some 8s. per ton.

The following work was carried out at the Munitions' Inventions Department Laboratory, at University College, London, in the early part of 1919, with the view of obtaining data upon which to base some estimation of the economics of the process and does not pretend to be in any way an exhaustive research. The gypsum used in the investigations was a finely ground and highly pure product obtained from a commercial source. The size of the grains varied from 0·05 to 0·2 millimetres in diameter, and an average sample gave the following figures on analysis :—

$CaSO_4$	78·9 per cent.
H_2O	21·0 per cent.

corresponding closely to the formula, $CaSO_4$, $2H_2O$.

Preliminary experiments showed that a 90 per cent. conversion of gypsum to ammonium sulphate was obtained after shaking together for one hour a mixture of gypsum and ammonium carbonate solution (about 4N), the $CaSO_4$ and the $(NH_4)_2CO_3$ being present in equivalent proportions. Excess of either constituent did not seem to give any advantageous yield. These experiments were carried out on quite a small scale, only some 100c.cs. of ammonium carbonate being used at a time. The ammonium sulphate solution was filtered off from the chalk and the two products were analysed. The methods of analysis adopted were as follows :—

Ammonia.—The Kjeldahl method was used throughout.

Carbonate.—Soluble carbonate was estimated by means of ammonical $CaCl_2$ with subsequent separation and titration in standard acid of the $CaCO_3$ precipitate obtained.

Sulphate.—In the early experiments the soluble sulphate was estimated by titration while hot with standard $BaCl_2$ solution, using potassium chromate as indicator. This was found to be not very accurate and the later work was controlled by the usual $BaCl_2$ gravimetric method.

It was seen from the results of the preliminary experiments that much larger quantities of materials would have to be worked with in order to obtain more reliable figures and to decrease the errors due to mechanical loss, &c.

In order to obtain exhaustive and intimate contact of the reacting substances, the following three-stage process was employed, using fairly large quantities of ammonium carbonate and gypsum. The reaction was carried out in earthenware vessels of some six litres capacity fitted with stirrers and with inlet pipes for the introduction of CO_2 if required. The process is of the ordinary counter-current type, and is shown in Fig. 2. The fresh gypsum A is stirred

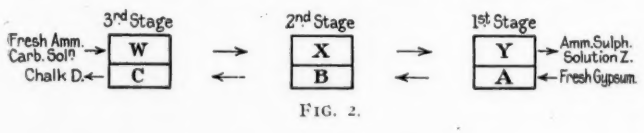


FIG. 2.

with the solution Y for one hour, after which the mixture is filtered and the solution Z is now the final ammonium sulphate solution ready for evaporation.

In the second stage the precipitate A goes to B and is stirred with solution X for one hour, after which the mixture is filtered and the precipitate goes to stage three, and the solution to stage one to encounter fresh gypsum.

In stage three the precipitate B goes to C and is stirred with some fresh ammonium carbonate solution W for one hour, after which the mixture is filtered, the solution goes to stage two and the precipitate D is now the finished $CaCO_3$. It is washed well with one litre of warm water, the washings being added to the rest of the solution going to stage two. The results obtained from a large number of such experiments carried out at a temperature of 20° to 25°C. are shown below.

The final $CaCO_3$ precipitate was a good firm mass which gave no filtration difficulties, probably owing to the high purity and absence of silica in the gypsum used. The filtrations were carried out in an ordinary earthenware filter attached to a water filter-pump.

An average analysis of the chalk after the washing described above gave the following figures :—

NH_3	0·62	per cent.
SO_4	1·28	,,
CO_2	42·11	,,
Moisture	40·81	,,

Amm. Carb. used.	Gypsum used.	Washing water used.	Total solution recovered.	Analysis of solution recovered.		Per cent. of NH_3 present as sulphate	Per cent. NH_3 lost.
Litres.	Gms.	Litres.	Litres.	NH_3SO_4	CO_2		
16	4,100	4	19·2	3·7	10·6	—	99·4	8·5
16	4,100	4	18·0	3·4	9·0	0·8	94·8	2·8
			Average	3·55	9·8	0·8	97·6	5·6

It will be seen from the above figures that some 95 per cent. of the ammonia is recovered in the process, and of this, about 97 per cent. is present in the form of ammonium sulphate. The excess of ammonia can be neutralised with sulphuric acid before evaporating the solution.

It is probable that with better and larger plant and with arrangements for cooling that even higher yields would be obtained and the mechanical loss of ammonia would be considerably reduced by working in suitably designed vessels.

Future of the Nitrate Industry

MR. THOMSON AIKMAN, in reviewing the fertiliser trade for 1919, states that the scarcity of shipping during the past six months will result in a materially smaller quantity of nitrate of soda being available in consuming markets than might have been disposed of had not British tonnage been vetoed from its transport up till October. The production of sulphate of ammonia has shown considerable falling off in Europe, which has not been counterbalanced by the increase in America. Synthetic nitrogen products are in much shorter supply than might have been anticipated, having regard to the great increase in their production, especially in Germany during the war. The high cost of labour and coal makes it evident that a comparatively small percentage of those war plants can be at present worked as commercial propositions for the supply of fertilisers.

The prospects of consumption during the coming season are everywhere regarded as most encouraging. It would appear probable that the actual quantities available in the consuming markets (including their present stocks) during the next six months are likely to be about 1,700,000 tons, of which it is estimated that Europe will have 900,000-1,000,000 tons, America 500,000-600,000 tons, and Japan and other countries 200,000-300,000 tons. The ruinous rate of exchange in Germany makes it improbable that anything approaching the pre-war quantity will be imported there during next season, owing to the low maximum prices fixed by their Government for home-grown produce.

An encouraging feature for the future of the industry is the rapidly increasing consumption in some countries that have hitherto been only small consumers of nitrate, chief among them being Spain and Japan, where purchases already made for next spring delivery are 150 to 200 per cent. greater than in any previous year. In Holland an increase of 40 to 50 per cent. seems probable judging by purchases already made. A big field is also likely to be found in Poland and Czecho-Slovakia, from where large inquiries have been received, but, owing to the difficulties in connection with finance, have only been met to a small extent. In the United States, a large increase in consumption next spring seems probable, judging by the extent of purchases already made. In this country an increased consumption is also probable, owing to the increased price of sulphate of ammonia.

The production of synthetic nitrogen products in Germany available for the coming spring is estimated at only about 300,000 tons owing to labour difficulties, but an increase to between 500,000 and 750,000 tons may be looked for when more normal conditions prevail. In Norway an increase of 50,000 to 100,000 tons has probably taken place during the war, and in France plants with an annual production of about 100,000 tons are still at work. In America the large plants started during the war have been closed, and similar schemes under consideration in this country are understood to have been dropped.

Modern Methods of Handling Barium Products

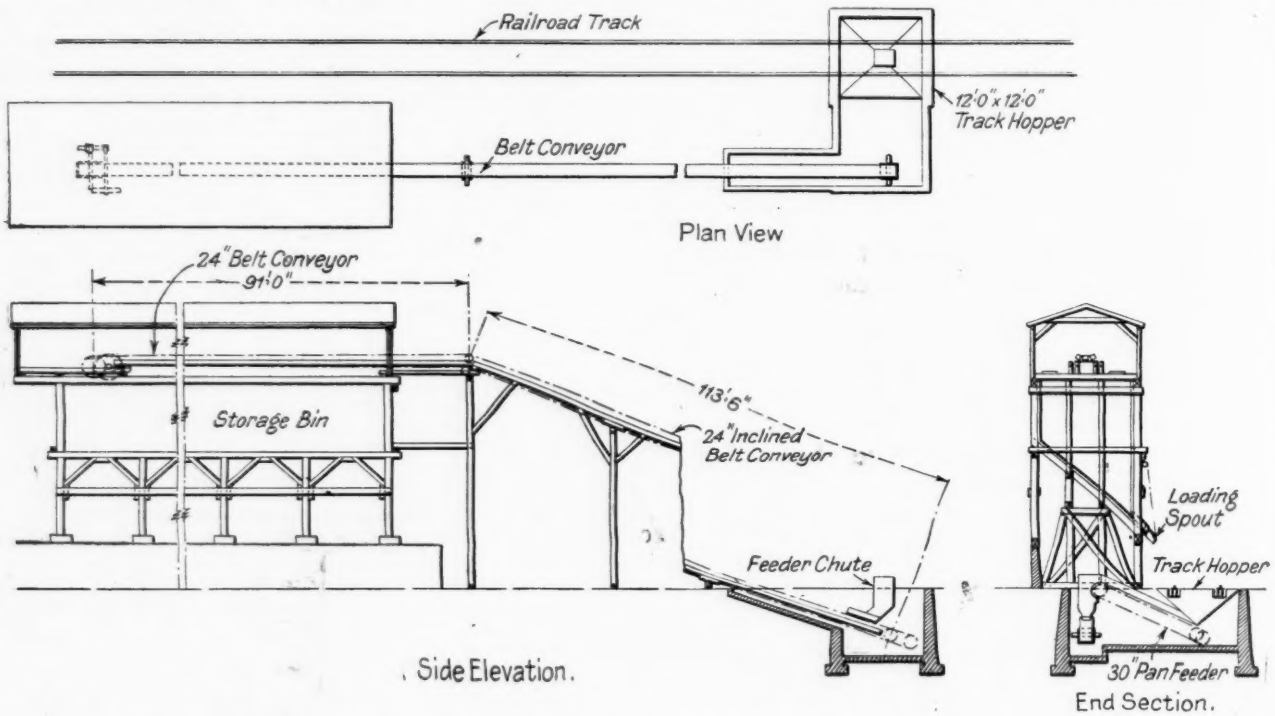
By G. F. Zimmer, A.M.I.C.E.

At a time when the saving of manual labour by the adoption of mechanical devices is of such importance in works organisation, the following account of an installation for the mechanical handling of barium products at an American works will be read with interest. It shows how heavy handling work, which formerly required the employment of eleven men, is now done by two.

DURING recent years barium compounds have played such an important part that no apology is needed for a brief notice of the very ingenious handling installation in use at the first factory in the United States for the production of these chemicals, the Rollin Chemical Co. at South Charlestown, West Virginia, which was established in 1913 for the purpose of manufacturing barium chloride and sodium products.

The principal raw materials which have to be handled in the manufacturing process are coal, limestone, and barytes ore. In former days these raw products were unloaded by hand from railway trucks and each kind was dumped, also by hand, in a great pile along the railway siding from which they were unloaded. When the raw material had to be reclaimed from these stock piles the method employed was equally antiquated. Men with shovels loaded it into narrow gauge industrial trucks which, when full, were pushed by hand to the boilers, crushers and roasters. Under this regime eleven men were constantly at work to keep the boilers, crushers and roasters supplied, and work it was too, as neither track nor rolling stock was entirely satisfactory.

The modernisation of this plant was a complete metamorphosis so far as handling and storing the materials went. When the question of reconstruction was under consideration the aim was to provide only one set of plant for handling the three kinds of raw material in the rotation and at the rate at which they arrive from time to time at the siding. It was first feared that there might be an element of risk in this, on account of the wide difference in the specific gravity of the products to be handled; the coal weighed 50 lb. per cubic foot, limestone 95 lb., and the barytes ore about 281 lb. Notwithstanding this diversity a band conveyor now handles the three substances equally well, but this difficulty was not the only one to be overcome. To use one set of machines for the three purposes also necessitated one central storage point for the three substances, and the problem of distributing them economically over widely scattered points about the plant had yet to be met, and schemes provided for such distribution. For this purpose narrow-gauge tracks were laid with a starting point at a sufficient elevation to allow a downward gradient for the trucks to run to their various destinations by gravity. Unlike the former practice these trucks are now filled not by hand, but by gravity, from the overhead storage bunkers.



From the illustration—a plan and two elevations—the layout will be understood. The railway trucks which bring the raw materials arrive on a standard gauge siding alongside the bunkers, which provide the necessary storage capacity for coal, limestone and barytes. The trucks are discharged into a track hopper 12 ft. square and are drawn from this by a 30 in. steel plate pan-feeder, which delivers at an incline (*see* cross section) on to the lower terminal of a 24 in. band conveyor, which is 204 ft. from centre to centre. The steel pan-feeder is for the object of paying out the material, which is fed intermittently into the track hopper at a uniform and continuous rate, on to the band conveyor. The first 113 ft. of this conveyor is inclined and reaches from below the ground level to just above the battery of bunkers, when the same conveyor assumes a horizontal run of 91 ft., so that all the bunkers can be fed by it. A self-propelling and self-reversing tripper or throw-off

carriage travels on rails over the bunkers and distributes its load between any two points which may be established by the man in charge. If, for instance, it is required to discharge limestone into a particular section of the bunkers set aside for this purpose, the stops will be so adjusted that the throw-off carriage will operate backwards and forwards automatically over this section only, so that no limestone can possibly be dropped into any other bunker, and the same applies to the storage of coal and barytes.

It will be seen from the cross section that the outlets of all the storage bunkers are sufficiently high above the ground to feed by gravity into trucks on the same side as on which the raw material arrives, but these outlets can equally well be on the opposite side which would be more advisable. The trucks after being filled at the bunker outlets proceed by gravity on to the platform of a lift and are raised to a sufficient height for them to run, by gravity, to their destination. The plant has been so arranged that when a truck has to be discharged it is still at a sufficient level to proceed empty again by gravity, back to the bunkers to be refilled, the same cycle of operations being repeated again and again.

It will be readily understood how economically such a plant will work, and with what care and forethought it was designed and erected by the Stephens-Adamson Manufacturing Co., of Aurora, Illinois. Instead of providing heavy work for eleven men, two only are now required, and then the work is only light. Most of the work is done by the machinery mentioned and the rest by gravity.

The Education of Directors

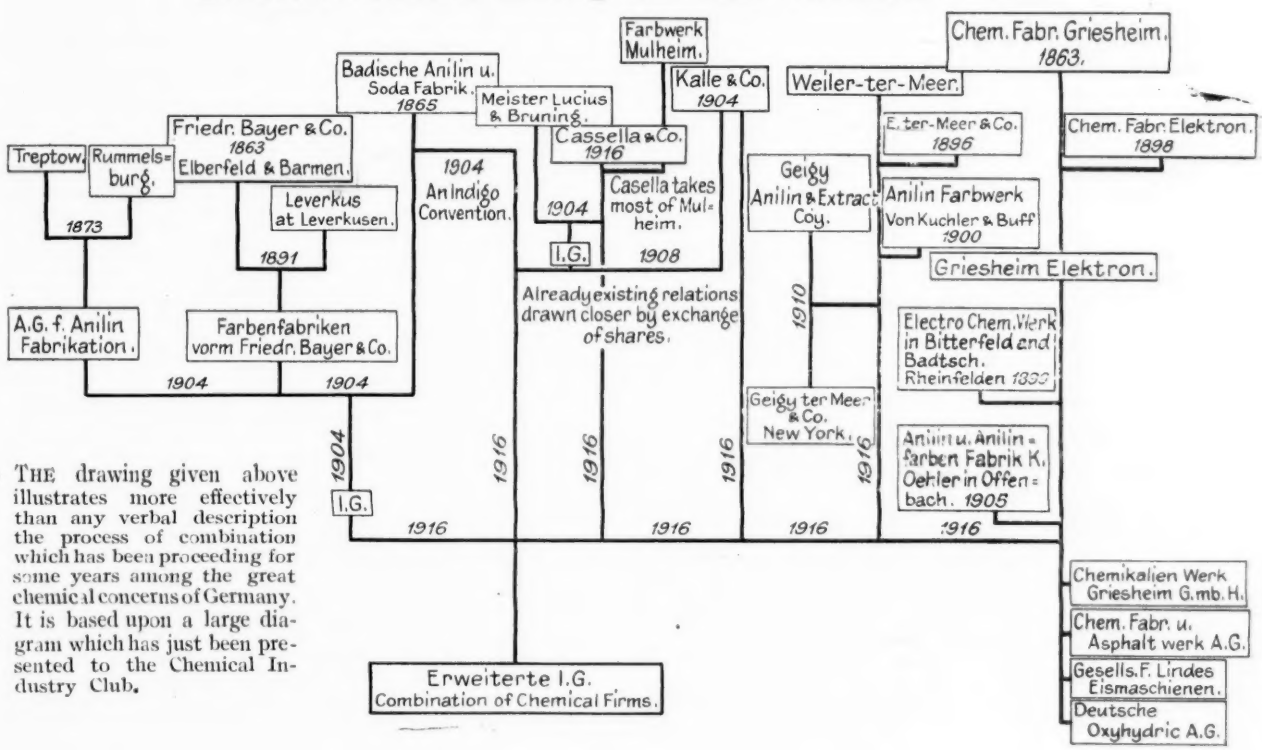
To the Editor of THE CHEMICAL AGE

SIR,—In a recent issue of THE CHEMICAL AGE it was suggested that a chair should be founded at Liverpool University to teach political economy to trade union leaders. I beg to offer a counter proposal, namely, that the chair should be devoted to the education of employers—more especially directors of companies, for the private employer stands on a somewhat different footing. Too often, directors of chemical companies are chosen without any regard to their knowledge of chemical processes, and the effect on works organisation is not good. It sometimes happens that processes are kept waiting for the arrival of the director, though the works foreman is quite competent to decide such matters himself, and the director, when he arrives, merely adopts the advice of the foreman, because he has little or no scientific knowledge of his own.

Much is heard to-day about increased production, but no matter how you educate the workers, they cannot increase production by more than 50 per cent. For increased production we must look to improved organisation. A few instances will illustrate this. In one works where the writer was employed, a process was carried out less well by a number of men than when only half the number were employed. The output of another operation might have been increased from one to three hundred had the foreman and originator of the process been permitted to have his way. At the same place four men do the same quantity of work that is done by one man at a works a few miles away, and owing to faulty arrangement not fewer than four men could do the work. The men to organise works are those technically educated. Every works should be permeated with such trained men to go among the workers, teaching them how to do things best, and at the same time learning from the men. Confidence between the leaders and the men is thus established, and the men respond well when they are shown by someone who knows how to do things in the quickest and easiest manner. The present method of pushing a man through the various departments where he gets but a smattering of sound knowledge just because he is somebody in particular, and then placing him at the head where he is over men who have spent years at their particular job, and at which they are experts, does not make for progress. The workmen weigh up such a man, have no confidence in him and too often no respect for him. A man to be a leader in industry must himself work in each department and study the science of the processes and their bearing and relation to one another. This is the type of man who will be chosen as a manager when directors are better educated in the science of works organisation and management.—Yours, &c.,

WORKS CHEMIST.

Collective Action among German Chemical Firms



THE drawing given above illustrates more effectively than any verbal description the process of combination which has been proceeding for some years among the great chemical concerns of Germany. It is based upon a large diagram which has just been presented to the Chemical Industry Club.

The German Chemical Industry

Papers before the London Section by Mr. E. V. Evans and Dr. Walpole

AT the meeting of the London Section of the Society of Chemical Industry on Monday evening, January 5, two addresses (of which officially prepared abstracts are given below) were delivered on the position of the German chemical industry. Mr. E. V. Evans, of the South Metropolitan Gas Company, who acted as chairman of a mission sent to the occupied area by the Board of Trade and the Association of British Chemical Manufacturers, dealt with "the natural and acquired facilities existing in the occupied area of Germany for the manufacture of chemical products; the outstanding impressions resulting from an inspection of chemical works in that area; and a consideration of the general position in the light of more recent developments in this country." Dr. G. S. Walpole, who was in Germany for several months, spoke on "The collective effort of German chemical industry." Mr. Julian L. Baker was in the chair and there was a large attendance.

Mr. E. V. Evans on the Dye Industry

Mr. EVANS stated that the outstanding impression gained during a visit of inspection to the large chemical works of the Rhine Valley, which included the works of the Bayer Company at Leverkusen, Meister Lucius and Bruning at Hochst, the Badische Anilin und Soda Fabrik at Ludwigshaven and Oppau, and Griesheim Elektron, together with a large number of smaller works, was that of a huge and highly efficient organisation temporarily paralysed. There was seen well organised and fully equipped plant known to be capable of supplying 80 per cent. of the world's requirements of dyes in pre-war years, which was found to be in a good state of repair and ready for operation, but lacking at the time of the visit the necessary raw materials and efficient labour. The latent potentialities of such an organisation, it was suggested, could only be fully appreciated by an actual inspection of these idle plants, and when consideration was also given to the special facilities afforded the industry, owing to its situation on the banks of the Rhine, viz., the excellent transport facilities, the power supply, the proximity of an inexhaustible supply of soft water, and many other assets which are both natural and acquired as the result of years of work, it was realised that such an immense potentiality in the world cannot be ignored. An inspection of the works demonstrated how assiduously the German has studied and applied scientific method to the various branches of business activity, and no little importance was attached to this factor in accounting for the success which had been achieved.

Having analysed many of the points which were considered to contribute essentially to the past supremacy of the inorganic chemical industry of Germany over that in this country, Mr. Evans stated that it was far from his wish to create or encourage the German bogie. It was, however, necessary to face facts, and although the efforts of British firms at present undertaking the manufacture of organic products deserved the greatest praise, it must, of course, be realised that the present attainment of Germany represents the work of 40 years. It could not be said that the British industry had had five years in which to resuscitate itself. The country had been at war, and the few firms which were allowed to continue the manufacture of colours had to devote their energies largely to supplying the requirements in dyes of the fighting forces of this and other countries. In addition to this, the impedimenta in the form of scarcity of labour and apparatus, and the fact that the raw materials required were often those which had of necessity to be controlled for the manufacture of explosives, had all contributed to render progress in this country slow.

While these huge organisations existed in Germany for supplying almost the whole of the world's pre-war requirements of dyes, Great Britain, Switzerland, America, and even France were doing their utmost not only to become self-supporting in the organic chemical industry, but to create a valuable export trade. In view of the fact that all these extensions were being made at a time when the cost of material and labour was so materially in advance of that of pre-war times, and that much of the German and Swiss capital had already been largely written down, it would appear to become of the highest importance that immediate steps should be taken by the British Government to ensure some form of protection to its organic industry, if it were serious in its desire to foster it and prevent the recurrence of a similar calamity to that in which this country found itself at the declaration of war.

Mr. EVANS expressed the opinion that the creation by the Board of Trade of a Trades and Licencing Committee was sound in principle and would have secured adequate protection to the key industry in this country had it been created on the scale which the nature of the work demanded. A few experts were chosen as members of this Committee, and they gave in an honorary capacity as much time as could be spared. The task, however, was a stupendous one and required a complete organisation of experts whose business it was to obviate the importation of dyes required by users but not manufactured in this country. A great financial risk was involved in building or extending plant at the present moment, and it was suggested that unless a remedy for these difficulties could be quickly formulated by the Government it was not to be anticipated that considerable progress would be made in the manufacture of new products.

Dr. Walpole on Germany's Collective Organisation

Dr. G. S. WALPOLE said that as the result of his visit he had come to the conclusion that the essential difference between the situation here and in Germany is that in Germany the "staff work" of the industry was so good. Each English works, big or little, had to fight its battles seriatim with the local authorities, the railways in the matter of tariffs and sidings, the inland revenue authorities, and, of course, the competition of his next door neighbour, who found no bar to immediately starting to work the same process if the margin of profit he was making would premit such a venture. It had always been strange that the Englishman, who in sport played for his side, should in business prefer to play a lone hand, whereas the German having no sport other than his business always played a highly developed system of combination of interests.

The picture conjured up by the German chemical industry to-day was team work in its highest development. One noticed everywhere the most stringent economy of materials and men, but the lavish expenditure of capital on plant designed to work with the minimum of attendance. It was as rare to see a man shovelling anything as to see a waste product. The power of the German chemical industry lay in its policy of united effort extending its control to every detail of their programme. The policy of having the Government railway service running into every works, however small, so as to avoid all intermediate handling, and the absence of anything corresponding to the obstructive policy of our inland revenue authority, might be attributed in no small measure to the staff work of the larger chemical manufacturers. A logical consequence of good staff work was the organisation of an industry as one big self-contained industrial body. It required the abolition of useless competition amongst its parts whereby one product was made in the small way in a number of little works, whereas another badly needed intermediate was not made at all and must be imported. Municipal bodies, railways, inland revenue authorities, harbour trusts and so on, were pressed to frame their regulations in sympathy with the needs of the chemical industry and not blindly to adhere to edicts laid down when the technical properties of chemical products as well as their value were less well understood than they were at the present time.

The thoroughness with which the whole cycle of operations in Germany was studied by the chemist in the first instance, the sureness with which the chemical engineer laid out every detail of the plant, and the experienced confidence of the banks was very striking. Plants were not put down piecemeal haphazard with a view to catch some temporary gain but were finished, well designed and thorough, as part of a combined policy which took the world market as its main consideration.

Summing up his impression Dr. Walpole said: The power

of German chemical industry lies in its policy of united effort extending its control to every detail in their programme. It is the Army and the Aliens Bill and certain protectionist legislations that stand to-day between us and the extinction of synthetic chemical industry here. During the last five years it has had the most wonderful protection of providence. Chemists were very largely withdrawn from positions of physical risk and danger in the field, large numbers of men who were never inside a works before have had to handle plant, and workmen; and men from University staffs, have got into quite close touch with the proprietors and managers of chemical works. All this was done under a system of protection against imports, except, of course, those from America, France, Norway, Sweden and Japan. Now the shielding influences will one by one be withdrawn, and trench warfare behind barbed wire will develop into battles in the open. Man for man we will have to hold our own; our plant and our training will be put to a severe test, but the whole issue will depend upon the collective action of the big chemical interests in this country, and upon their "staff work." If they get together and develop on lines of mutual help and support, we can stand up to the great organisations with which we will have to compete.

Discussion

THE CHAIRMAN said that although there were many points in the German system which were opposed to our ideas in this country, there were others which we could take up and instil into our chemical industry, particularly in regard to the excellent staff work to which Dr. Walpole had referred.

Mr. ANDERSON thought the two addresses constituted a valuable contribution to an understanding of the pre-war supremacy of the German chemical industry. The method of handing over a particular subject to a number of workers often produced a large amount of knowledge whether it was pertinent to the object originally in view of not, and it was the German system to sift and file this information for future use. Our educational system was in a deplorable state compared with that of Germany, whilst the organisation of the I.G., was remarkable. The banks also, in Germany, took a far greater interest in industry than was the case here, and if we only combined the German method with our commonsense we should certainly come out on top.

Captain C. J. GOODWIN referring to Mr. Evans's request that the Presss hould adhere to the official abstract of his address, said he saw nothing in what had been said which could not be published.

Mr. H. P. STEPHENS referred to an instance of a man pounding material in a mortar by hand as an example of waste of labour, which was at variance with what the authors had said. The incident he referred to, however, took place 15 years ago.

Dr. W. R. ORMANDY thought the chemical industry was not one to be developed on individual lines, and if we were going to stick to our principle of working in small units we must reconcile ourselves to the fact that it was only a question of time before Germany got back her supremacy, not only in the chemical industry but in the iron and steel and other industries. For instance, there was gas making. Gas works were to a certain extent the starting point for the chemical industry, and it must be recognised that distilling coal and taking off the gases and the tar and ammonia water and everything else and condensing them into one mass and handing that over to a tar distiller was not exactly a scientific method. It was quite obvious that the process could be done in a much more scientific way, and it had been done in a much more efficient way in Germany. It stood to reason, when they came to think of it, that if they cooled the gases down sufficiently slowly they could find the dew points at which the tar would come down, and if the gases were kept at that point for a reasonable length of time they could get tar and nothing but tar, and by a process of fractionation it was possible to get the heavy oils and then the light oils, and it was possible by using a counter current system to condense so that no ammonia would escape. In that way he had collected a large amount of information as to the dew points of various bodies and the specific heats and the latent heats, but nobody would spend money on such works in this country. The gas works up to the time of the war were allowed to make a specific interest, and they did that with the greatest ease, and what was the use of worrying? The Germans always thought it was worth worrying, however, if they saw a prospect of improving the process, and they were always ready to spend more money on research than we were.

Dr. BUSH agreed that it was the practice in Germany to keep a man on one job for years, and after a while these men had to accept what salaries were offered them because they could not get employment with competing firms owing to the existence of a ring among the firms, who would not employ men who were black listed. He would like to know something about the Boards of Directors in Germany because a representative of every union concerned in the work now sat on these Boards, and no decision could be come to without consulting even the office boys' union. He failed to see how they were going to work on these lines.

Mr. A. E. BERRY thought we should not be wise as a nation to adopt the method of German railways of carrying such substances as chlorine without restrictions, owing to the dangers which it involved.

Mr. H. M. RIDGE did not agree that chlorine was carried on the German railways without question. Before the war the restrictions were very severe, but they might have been relaxed during the war, and were not yet fully in operation again. Neither was it such an easy matter as had been suggested to obtain sidings for private works; indeed, the restrictions were such that we should not put up with them in this country except, perhaps, under compulsion from a Government monopoly. The separation of the higher trained staff from the others in German chemical works was a notable feature, and the policy of having men who had obtained university degrees in charge of plant was responsible for the success of the German chemical industry. He contrasted the lack of inland water facilities in this country compared with Germany. Again, it was not easy, before the war, to obtain permission to build works, and he recalled with satisfaction that on one occasion a competitor in connection with zinc smelting was unable to get permission to build a works on the Rhine, and had been delayed some four or five years. On the question of lack of waste in the German chemical industry, he mentioned that at Hochst there were something like two miles of dumps consisting of the material obtained after the use of zinc dust for reducing purposes, and no attempt was made to recover a large proportion of this material.

The Lecturer Replies

Mr. EVANS, in reply to Capt. Goodwin, said his experience with the Press—not particularly the technical press—was that he always preferred to hand over what was to be published or to have the opportunity of correcting it. Dr. Ormandy had mentioned a matter which hit him very personally, but he hoped Dr. Ormandy did not include the larger gas companies in what he said. He knew the processes referred to very well, and had seen them in Germany, but it was an immense undertaking to distil over an organic product at the rate at which coal was distilled in the London gas works—somewhere between 5,000 and 7,000 tons per day—and to build plant to receive fractionally the condensates of the tar. He knew it was perfectly possible, but those who had been in touch with what the Germans were doing had come to the conclusion that they had better let the Germans do it because when it was done they might be able the better to impress their directors with the advantages of it. It must be realised at the same time that a gas company was very much restricted in what it could do. It was usually what was called a statutory company, and it was not allowed, however ambitious it might be, to rip out plant ruthlessly unless it was very sure of its ground. The Board of Directors of German companies reminded him of a cartload of monkeys, for he had never seen a set of men who talked as they did and contradicted themselves so wonderfully. That was the experience the members of the mission had had.

Dr. WALPOLE who also replied, said that as the result of the revolution in Germany it was the policy to do as Dr. Bush had mentioned in regard to the Boards of Directors, viz., to have representatives of all the unions upon them. As an instance of the power of the betriebsrate—the equivalent to our shop stewards—he mentioned that on one occasion a notice on a works to the effect that owing to the increase in thieving the management reserved the right to search any workman, was altered to "any workman or director." At the same time, it was not the policy of the betriebsrate to restrict output as was the case in this country. He thought the zinc dumps referred to by Mr. Ridge would have been worked if they had been worth it.

A hearty vote of thanks was accorded Mr. Evans and Dr. Walpole at the conclusion of the discussion.

Grays Chemical Works, Ltd.

In Voluntary Liquidation

A MEETING of the creditors of Grays Chemical Works, Ltd., 4, Broad Street Place, London, E.C., was held on Monday, at the Institute of Chartered Accountants, Moorgate Street, E.C., Mr. A. N. Harper, liquidator, in the chair. The shareholders of the Company had previously passed an extraordinary resolution to the effect that the company could not, by reason of its liabilities, continue its trading, and that it was advisable to wind up the concern voluntarily. The Chairman pointed out that the creditors had been called together in accordance with the Companies Act and they could decide whether an application should be made to the Court for the appointment of another liquidator to act in his place, or jointly with him, or for the appointment of a committee of inspection. In answer to questions the liquidator stated that he had not been able to prepare a detailed statement of affairs showing the position of the company. A receiver had been appointed to act on behalf of the debenture holders in the company. After a short discussion it was decided that the meeting should be adjourned in order that the liquidator should be given time to prepare a statement of affairs for submission to the creditors.

The Faraday Society

Officers for the New Year

At the annual general meeting of the Faraday Society, held on December 15, in London, the following officers and members of Council were elected to serve for the ensuing year: *President*, Sir Robert Hadfield, Bart., F.R.S.; *Vice Presidents*, Mr. W. R. Cooper, Professor F. G. Donnan, Mr. E. Hatschek, Professor A. W. Porter, F.R.S., and Mr. E. W. Rayner. *Treasurer*, Mr. Robert L. Mond. *Council*, Dr. J. Allmand, Dr. H. Borns, Professor C. H. Desch, Dr. J. A. Harker, F.R.S., Mr. Cosmo Johns, Mr. Harold Moore, Professor J. R. Partington, Dr. W. Rosenhain, F.R.S., Sir T. Kirke Rose, and Dr. George Senter.

The ordinary meeting of the Society took place on the same date, Professor Porter (vice-president) in the chair. The Chairman referred to the loss the Society had sustained by the early death of Dr. H. C. Greenwood, a young member of great promise, who had been carrying out important work for the Nitrogen Products Committee. A vote of condolence with Mrs. Greenwood was passed.

In a Paper read by Mr. A. G. Tarrant, B.Sc., on "The Measurement of Physical Properties at High Temperatures," an account was given of experiments made upon refractory materials with a view to measuring certain physical properties at high temperatures, particular attention being paid to thermal expansion, tensile strength and thermal conductivity. A spiral furnace and stressing arrangement, suitable for work up to 1,800°C., was described, and the results obtained roughly indicated.

Lieut. W. A. Macfadyen, M.C., B.A. (Cambridge), read a Paper on "Electrolytic Iron Deposition." The experiments detailed were carried out in seeking the best conditions for obtaining thick, hard, adherent deposits of iron on steel mechanism parts which had been machined too much, or worn down in a few places, and thus rendered useless, so as to enable the scrapped parts to be replaced in use after treatment. A simple solution of ferrous ammonium sulphate in water was used as electrolyte, the only additions being sulphuric acid, and later, powdered charcoal. In the cold, the best deposits were obtained from concentrated solutions made about 0·005 normal with respect to sulphuric acid, the current density being up to 23 amperes/square ft. From a solution saturated in the cold, heated to 65°C., and made about 0·02 normal acid, excellent deposits were obtained at current densities of up to some 200 amperes/square ft, whilst metallic iron in rather less suitable form was deposited at the highest current density obtainable in the laboratory, namely, about 1,000 amperes/square ft. If iron be deposited direct on to a steel base and the whole subsequently annealed above the A_2 point for pure iron, the two become strongly welded together. Subsequent case-hardening is then usually advisable, since the annealed electrolytic iron is very soft.

In a Paper by Mr. J. Guilfoyle Williams, B.Sc., A.I.C. (Glasgow), on "The Electrolytic Formation of Perchlorate," it was pointed out that present practice in the electrolytic preparation of perchlorate uses much higher temperature of liquor, and current density, than is given in text-books. Experiments were given showing that the current efficiency of the electrolysis is not considerably affected by liquor temperatures up to 60°C. Production of 1 kilo $NaClO_4$ at this temperature requires only about 3·0 K.W.H. against about 3·6 K.W.H. for normal practice. During normal electrolysis the liquor is alkaline, owing to the presence of sodium hypochlorite; if this alkalinity is kept down by the frequent addition of hydrochloric acid, the current efficiency of high temperature electrolysis is improved.

Professor A. W. Porter, D.Sc., read a Paper on "The Vapour of Binary Mixtures."

Professor E. D. Campbell (University of Michigan) presented a Paper on "The Solution Theory of Steel and the Influence of Changes in Carbide Concentration on the Electrical Resistivity." The experimental portion of the Paper described a research on the influence of the decarburisation by means of hydrogen of a series of alloy steels on the electrical resistivity, when the metal was in both the annealed and hardened condition. Annealed steels containing considerable amounts of chromium, tungsten, and molybdenum showed on decarburisation a marked increase in resistivity, due to the removal of the carbon from complex carbides and the dissolution of the metals in the iron. The measurements tabulated indicated marked differences in the constitution of the carbides in the various steels.

Mr. Shinkichi Horiba presented a Paper entitled "Some Relations between the Solubilities of Solutes and their Molecular Volumes," and Dr. E. J. Hartung (Melbourne) Papers on "An Accurate Method for the Determination of Vapour Pressure," and "Some Properties of Copper Ferrocyanide."

Petroleum Exploitation Co.

A PETITION for the winding up of the above company was presented to the High Court of Justice on December 18, 1919, by Herbert Greenwood Teale, of Atlas Chambers, King Street, Leeds. The petition is directed to be heard at the Royal Courts of Justice, Strand, London, on January 13, 1920.

Tyneside Chemical Industry

In a supplement to the *Newcastle Daily Chronicle* an interesting history is given of the chemical manufacturing industry on Tyneside. In the year 1866, the writer states, there were about 26 alkali works in operation in the Tyne district, producing soda ash, caustic soda, soda crystals, bicarbonate of soda, bleaching powder, and other forms of heavy chemicals. The industry is now represented by two works only—one at Gateshead, known as Allhusen's Chemical Works, and the other at Hebburn, of which Sir Charles Tennant and Partners were formerly the proprietors. Both these works are now owned and controlled by the United Alkali Co., Ltd. The causes which have brought about the stopping and dismantling of so many chemical works since 1866 are various, amongst them being the progress of science. The process under which chemicals were produced on the Tyne is known as the Le Blanc process, and consisted of the decomposition of common salt by sulphuric acid resulting in the production of chlorine and alkalies. It has now been proved that chlorine and alkalies can be produced more cheaply by other methods, and particularly by the use of brine. Hence the Le Blanc process has been very largely supplanted by the ammonia alkali and the electrolytic processes. Large works for the production of carbonate of soda by the ammonia process have been erected by Messrs. Brunner, Mond & Co., and the United Alkali Co., and they have established such works in Cheshire and elsewhere, where natural brine is found in inexhaustible quantities. No deposits of salt, either in the form of solids or brine, exist in the Tyne district. This fact largely explains how the manufacture of alkalies and chlorine on the Tyne has yielded to the lower costs of production under other methods, as stated, at points where natural brine exists, and to such conditions is largely due the gradual transfer of the manufacture of chlorine and alkalies from the Tyne to Cheshire.

Furthermore, within recent years, the production of chlorine and caustic soda by the use of electrical energy has been brought to a state of practical demonstration. The directors of the United Alkali Co. have expended large sums of money in introducing into their works at Gateshead an electrical plant under which chlorine, bleaching powder and caustic are produced. The consumption of sulphuric acid in this district is large and on the increase, by reason of the constant additions to code plants, and the output of this acid at the Tyne Chemical Works is said to be quite sufficient to meet the demands of the district. With the extension of electrical methods, electrodes are becoming in greater demand, they being absolutely essential for the electrical processes. Hitherto, this country has been entirely dependent for its supply of electrodes upon the United States. New works, however, have recently been erected at Hebburn in which manufacturers and others in the district are interested, for the production of electrodes, in order that the United Kingdom might no longer be dependent upon America for this important material, and it is to be hoped that the efforts on behalf of the new company may meet with the success they deserve.

Restoration of the French Mines

The Committee which have been drawing up reports for the French Government on the extent and costs of the restoration of the mines in the North of France state that the damage is divisible into two distinct zones. In the one zone, which covers mainly the districts of Ostricourt, Escarpelle, Flines, Aniche, Azincourt, Anzin, Douchy, Vicoigne, Fluvencelles and Crespin, production was carried on until the day of the German retreat in October, 1918. Only a few above-ground installations were destroyed in this part. The impossibility during the last days of the occupation of keeping the pumps going resulted in a flooding of the lower surface of many pits; this was soon remedied, and the output now amounts to 100,000 tons a month. In the second zone, which comprises the districts of Lens, Courrières, Liévin, Neurchin, Dourge and Dricourt, the above-ground plant is almost entirely destroyed, much of the shaft timbering broken, and the pits flooded, but it is hoped to have the pits dry by May, 1920. The question of an escape for the water is very important; considerable regulating and damming work will have to be done on the rivers Scarpe and Beule in order that the mine water may be run into them. The cost of repairing the underground workings is estimated at about 15 francs per ton produced; for the Lens minefield, therefore at 60 million francs. The time required is estimated by the Lens company alone at 8½ million working days. As this company had in 1914 only 1,300 workers, the restoration work would take two years, provided the entire staff could be obtained. The Lens directors do not think they will be able to attain their pre-war output for six or seven years. The housing problem for the workers in the completely destroyed zone is a vital one (in Lens scarcely 100 out of 1,500 houses are restorable); the cost is estimated at 2½ milliards. A preliminary credit has been granted, and has been used mainly for getting pumps. The output is very low; in January, 1919, it was only 1,500 tons; in February, 4,800 tons; in March, 14,500 tons; in May, 29,500 tons. The output has risen since then, and was in October about 100,000 tons, when 18 pits were being worked.

A New British Glassworks

Great Riverside Enterprise at Charlton

THE United Glass Bottle Manufacturers, Ltd., are erecting works by the side of the Thames at Charlton, near Woolwich, which, in that branch of the glassware trade devoted to the production of "containers," are expected to play an important part in promoting the trade of this country in the markets of the world. The estimated cost of the works under construction (The *Daily Telegraph* states) is £400,000, and it is hoped that a few months hence a portion of the plant will be running. In a year's time it is anticipated that the factory will be producing bottles at the rate of over 100,000,000 per annum. This will not exhaust its capacity, as future plans provide for an output of more than double that quantity.

The great influence of American inventions, particularly those associated with the Owens patents, on the development of the English glass industry is well known. The Owens automatic machine is capable of producing varieties of small bottles at the rate of 200 a minute. As many as 75,000 quart bottles can be manufactured by it in a single 24-hour day, and at a meeting of the Society of Glass Technology recently it was stated by Dr. W. E. S. Turner that one of the Owens factories has an output of 80,000 fruit jars per machine per day. The latest types of these machines are being installed at the new London factory, and in addition to British capital and skill, American experience is being utilised in the engineering and chemical departments. It is stated that the works will in their equipment be unsurpassed by any in the world. Huge furnaces are in course of construction, foundations of warehouses and other buildings are being laid, a small locomotive has been installed, lines of railway are being operated from the river wharf to different sections, an area has been allotted for workmen's houses, and altogether a scene of activity is presented which stimulates the imagination and shows that British initiative is still a force in industrial development.

In view of the increasing demand for glass vessels of all kinds in this country and abroad, there is an eagerness to have the new factory in operation as soon as possible. In this, as in other industries, every day, is of importance in preparing for the world's markets. The requirements of the home trade are now considerable. In the year before the war Germany alone sent to this country glass bottles amounting in value to £422,367, an increase of £126,104 over the German imports of bottles three years previously.

The Owens Patents

When the war broke out the equipment of our glass bottle factories was far below the standard sufficient to meet our requirements. There was, for example, an urgent need for machines required in the manufacture of the small varieties of bottles consisting mostly of the white flint and amber types, the former used for essences, potted meats, medicines, &c., and the latter particularly for foodstuffs. These containers were indispensable, but we had not been able by the hand process to compete with the foreign methods of production, and, the importation from Continental countries having been cut off, the necessity arose to find other sources of supply. Not only had Germany enjoyed a large share of our home bottle trade, but her manufacturers had the largest interest in a company which controlled the European rights in the Owens patents. After the Owens machine made its appearance, revolutionising the manufacture of bottles, an American company offered, in England, the patent rights connected with it for all countries except the United States, Canada, Mexico, China and Japan for £600,000. The importance of securing these rights was apparent, but manufacturers in this country had suffered severely from foreign competition, the industry was at a low ebb, and British producers were not inclined to make the outlay of £600,000. Eventually manufacturers in Great Britain, Germany, Austria, Holland, Norway, Sweden and Denmark joined for the purchase of the European rights, those in this country who combined for the purpose being known as the British Association of Glass Bottle Manufacturers, Ltd. A European or central company was formed, the manufacturers of each country undertaking to invest in proportion to production, and as the output of Germany was the highest, the proportion of German capital towards the £600,000 was greatest. The company was formed in Berlin, and became known as the Europäischer Verband.

The extent to which Germany had met our requirements was soon appreciated after the war broke out, and in 1915 the necessity for bottles became so urgent that at the instigation of the Board of Trade representatives of the British Association of Glass Bottle Manufacturers, Ltd., visited America to see if supplies could be obtained from the manufacturers who controlled the Owens patents, and who were themselves large manufacturers of bottles. An effort was also made to induce them to accept orders for machines. An interesting point arose in this connection, because one of the conditions attached to the sale of the patents to the European company rendered the American company liable to a penalty of £50,000 for each offence of supplying machines, bottles, capital, &c., to any of the territories included in the transaction, without first having obtained the consent of the Europäischer Verband, which included manufacturers of different Continental countries. Thus, bottles became a question of international negotiation. The authorities in this country did not intend to allow any agreement of this character to bar our manufacture of machines; but, as we were concentrating on war equipment, it was regarded as advantageous to secure appliances and bottles from the United States, if possible. Provisional contracts were made in America, and towards the end of 1915 bottles for Great Britain became the subject of a meeting of the directors of the Europäischer Verband at the Hague. The British representatives secured the consent which the American manufacturers required, on the condition that the latter paid certain royalties to the Public Trustee to the credit of the whole of the members of the Europäischer Verband, namely, British, Germans, Austrians, Dutch, Danes, Norwegians and Swedes. They were also able to place an order in America for a number of machines. And thus, in war time, was solved an international problem over bottles.

Future of the Industry

The problem now is how to meet present demands, and it is in order to assist in providing a solution that the United Glass Bottle Manufacturers, Ltd., are erecting new works and developing others. They have 18 machines of the Owens type either installed or in readiness for installation at their works at St. Helens and at their new factory at Charlton, and arrangements are being made for the construction of others in this country. The Europäischer Verband is being wound up, and in the future the seat of control will probably be in this country. It is the intention of the United Glass Bottle Manufacturers to enlarge the British processes of production, particularly in the direction of making what are known as small white flint bottles which hitherto have come almost entirely from the Continent. The position in which we were placed after the outbreak of the war has stimulated the study of our own natural resources, the value of which, in regard to the glass industry, has not been adequately appreciated, with the result that we have relied upon the products of foreign countries. Now, in connection with the Government Department of Scientific and Industrial Research, a Glass Research Association has been formed, whose investigations, combined with new enterprise on the part of manufacturers, should give an impetus to the industry. Increased attention is being devoted to sand deposits, and an expert has stated that we should be able to manufacture all the containers that are required from raw materials obtainable in this country, and, provided fuel is reasonable in price, to export articles at a sum which will meet successfully foreign competition.

The New High-speed Steel

WITH respect to the reports of discovery by Dr. Arnold of a new high-speed steel in which no tungsten is used, Messrs. Darwin & Milner, Ltd., Messrs. Sybry, Searls & Co., Ltd., and Messrs. The Spartan Steel Co., Ltd., all of Sheffield, state that they have been manufacturing tungstenless molybdenum high-speed steels for some considerable time, and have given very great attention to the theory and practice of alloy steels generally. They fully endorse Dr. Arnold's view that molybdenum in high-speed steel produces far better results than tungsten, but dispute the claim that his formula is new, and also that vanadium has proved an efficient stabiliser of molybdenum when used with it. Not long after the introduction of tungsten high-speed steel (they state), molybdenum high-speed steel, both with and without vanadium, was made in the United Kingdom, France, Germany, Luxembourg, Austria and the United States, similar to the formula which Dr. Arnold has now made public. The occasional startling results of such molybdenum mixtures, superior to the very best tungsten high-speed steel, induced many firms to plunge into schemes for producing molybdenum steels on an extensive scale, but all had to be abandoned, because the resulting product lacked uniformity. Much of it was of excellent quality, but, on the other hand, batches of tools failed entirely when subjected to workshop tests, although they showed the correct analysis. In the cases where vanadium was added, it failed to be uniform in bulk manufacture, just the same as the molybdenum steel without vanadium, consequently the makers fell back upon tungsten. They attribute Dr. Arnold's faith in vanadium as a stabiliser to molybdenum steel to the circumstance that he experimented merely on small quantities. Only bulk production can disclose the presence or otherwise of a real stabilising element. Mr. P. R. Kuehnrich, of Sheffield, who has the reputation of having carried out more tool steel alloying experiments than any living man, made the discovery that cobalt acted as a definite stabiliser to molybdenum, and he patented a formula to this effect. As the licensees under that patent, they state that they have made and distributed hundreds of tons of the Como brand molybdenum super high-speed steel, and completely proved that cobalt is de facto a stabiliser. Como steel is now largely used in many parts of the world, and is thoroughly justifying the warranty advertised in the technical Press, guaranteeing it to produce results superior to tungsten high-speed steel. The molybdenum high-speed steel is more costly to produce than tungsten steel; users, however, are only too willing to pay the higher price, as the greater service the material renders makes it intrinsically the cheaper material.

From Week to Week

QUININE SULPHATE has now been added to the articles within the operation of the Profiteering Act.

MR. BENJAMIN PRESTON, aged 83, who has just died at Batley (Yorks.), was for 20 years secretary to Messrs. Wilkinson & Akeroyd, Ltd., soap manufacturers, Perseverance Works, Mirfield.

MR. H. MEAD TAYLOR has been appointed Accountant-General to the Board of Trade, in succession to Mr. A. Barnes, who retired on December 31, after 46 years' service.

MCGILL UNIVERSITY, MONTREAL, where the late Sir William Osler was educated, has decided to establish a Chair of Medicine as a memorial to him.

THE LIBEL ACTION in which Sir Alfred Mond obtained £5,000 damages is to be reviewed in the Court of Appeal on the appeal of Mr. H. H. Beamish, one of the defendants in that suit.

DEFENCE OF THE REALM REGULATION 8AA, which prohibited the establishment of new retail businesses without the consent of the Minister of Labour, has been revoked as from December 20, 1919.

THE ALUMINIUM WORKS in the Conway Valley which were visited by the Prime Minister last week, are the property of the Aluminiun Corporation, Ltd., and not of the British Aluminium Co., as stated in our issue of January 3.

AT THE VILLAGE OF ELTON, DERBYSHIRE, last week, the Barmaster performed the ceremony of giving possession of the old Raithe mines to a combine of 100 leadminers, who are to work the mines for their own profit.

DAMAGE amounting to several hundred pounds was caused by an outbreak of fire in the dyeworks of Messrs. Fletcher Brothers, Ltd., Raglan Street, Halifax, Yorks., last week. The damage is covered by insurance.

PROFESSOR ROBINSON, of the department of Organic Chemistry of the Liverpool University, has accepted the offer of an appointment as director of research in the dyestuffs department of the British Dyestuffs Corporation, of Huddersfield.

WE UNDERSTAND that the recommendations of the National Sulphuric Acid Association, referred to in an Editorial note last week, for the increase of prices B.O.V. to gasworks for the manufacture of sulphate of ammonia, apply also to coke ovens and other works for the manufacture of sulphate.

IT IS REPORTED that 40 square miles of salt areas have been bonded in Nova Scotia extending from Malagash to Oxford Junction and Salt Springs. One bed is 900 ft. in width and 80 ft. deep and is running 98 per cent. pure salt. Experiments on these salt beds are being conducted to determine the percentage of potash.

IN A REPORT on trade in South Africa, received by the Federation of British-Industries from Mr. C. W. Francis Harrison, its special commissioner in South Africa, the possibility of extracting ammonia gas from horns of cattle is mentioned in connection with the demand for ice-making plant, in which ammonia is employed.

DR. EDWARD ARDERN, F.I.C., formerly chief chemist, has been appointed consulting chemist to the Rivers Committee of the Manchester Corporation, and has joined Mr. S. E. Melling, F.I.C., consulting chemist to the Salford Corporation, public analyst for the County of Chester, &c., in practice as analytical and consulting chemists at The Cliff, Higher Broughton, Manchester.

WHARTON FORDHAM (63), forman grinder, and Fred Kirk were killed by an explosion which occurred on Wednesday at Messrs. Brassard & Crawford's chemical works, Chald Lane, Wakefield. The explosion took place in the grinding department, where the aniline colours are made, and the shed was completely wrecked. Sydney Noble and two others are suffering from minor injuries.

AT HUDDERSFIELD, on Friday, January 2, John Craven, a firer in the employ of the British Dyestuffs Corporation, was fined £5 for attempting to defraud the Company of 3s. 6d. Craven was granted permission to leave work on December 16 at noon, but his card was marked 1.53. The man who relieved him "clocked on" at 12.2, and the two hours would thus have been paid for twice if the incident had not been discovered.

THE GREAT LAKES PAPER COMPANY, LTD., a large American Corporation, is about to begin operations at Port Arthur, Canada. The first unit of construction is to be a ground wood mill capable of turning out 30,000 tons annually, a sulphide mill to produce 7,500 tons annually, and a newsprint mill with a capacity of between 33,000 and 35,000 tons per annum.

APPLICATIONS ARE INVITED for the Chair of Bio-Chemistry in the Faculty of Medicine at the University of Cape Town. The salary is £800 per annum, rising by annual increments of £40 to £1,000. A temporary war bonus of £84 is given in the case of a married man, £18 in the case of an unmarried man. £50 passage money is allowed. Further particulars can be ascertained from the High Commissioner for South Africa, 32, Victoria Street, S.W.

IT IS REPORTED that Dr. W. B. Davidson, who resigned the engineership of the Nechells Gasworks of the Birmingham Corporation over four years ago to take up the position of chief chemical engineer with the new firm of British Dyes, Ltd., of Huddersfield, is going into partnership early this year with Dr. A. C. Michie, a consulting chemical engineer in Newcastle-on-Tyne and district. The partnership will be conducted under the name of Michie & Davidson, consulting chemists, 12, Akenside Hill, Newcastle-on-Tyne.

THE FOLLOWING PARTICULARS are published of the stocks of non-ferrous metals (exclusive of old metal and scrap) in this country in possession of the Minister of Munitions on Janaury 1: Copper, 10,095 tons; spelter (G.O.B., 10,318 tons; ditto, refined, 9,754 tons; aluminium, 7,084 tons; soft pig lead, 54,975 tons; nickel, 1,650 tons; antimony regulus, 2,775 tons. A proportion of the above stocks is already sold to the trade for forward delivery.

THE BRITISH RESEARCH ASSOCIATION for the woollen and worsted industries is removing from temporary headquarters in Leeds to permanent headquarters in Bradford. Hitherto the work of the association has had to be carried out at the university and other laboratories. In future the association will have its own laboratories in Bradford. The association now comprises 450 influential firms in the industries, and includes a direct representative of the Government Department of Scientific and Industrial Research.

IN ORDER TO BUILD new factories for the production of nitrogen manures by the Haber process, the Aniline Organisation, which comprises most of the leading German chemical factories, has doubled its share capital, which now amounts to more than six hundred millions. It is probable that owing to the economy of the Haber process, according to which only air, water and coal are needed for the production of nitrogen, Germany will in future be in a position to export chemical manures instead of having to import them.

THE LIST OF NEW COMPANIES formed in the last six months of 1919, prepared by Messrs. Jordan & Son, shows an unprecedented increase in the number of new companies registered and the amount of capital involved. The number of new chemical companies registered in London was 168, with a capital of £4,850,730, while the number registered in Edinburgh and Dublin was 18, with a capital of £160,250. The new oil companies registered in London numbered 61, with a capital of £18,749,185, and the number of new patent medicine companies 16, with a capital of £466,500.

ANOTHER IMPORTANT ENTERPRISE on the part of Messrs. Lever Brothers is announced. The firm have acquired some 140 acres of Lord Temple's estates on the banks of the Avon at Newton St. Loe, the western suburb of Bath, where a huge candle-making factory is to be established. The tenants of the land have been informed that possession will be required in March. It is stated that to raise the site above flood level alone will cost £100,000, and that the total expenditure contemplated is close on £1,000,000. A garden village is to be set up, with model houses for the workpeople. Some 6,000 hands will, it is believed, eventually be employed at Kelston.

AT THE ANNUAL MEETING of the Science Masters' Association in London on Tuesday, Mr. W. W. Vaughan, master of Wellington College, said that, with the discontinuance of poison gas and deadly projectiles, an idea was growing that scientists, and especially chemists, must labour and make discoveries for commercial prosperity. It should be remembered, however, that history taught that merely utilitarian science always degenerated in the end. Sir W. Tilden, referring to the demand for an increase of science teaching, remarked that it was almost always based on the idea that nowadays chemists were supposed to be earning large salaries—a view, unhappily, not supported by the facts.

FOR THE SECOND TIME, the Bath City Council have declined to accept the recommendations of the Sanitary Committee with regard to the appointment of a city analyst in succession to Mr. J. W. Gatehouse. The earlier proposal was that the Somerset County Council should perform the work at their own laboratories. This was referred back, and a fresh scheme was proposed, under which terms were suggested for the appointment of a public analyst for the city, who should also act as a gas examiner. The Chairman of the Sanitary Committee (Councillor Vezey) still favours the earlier proposal; but the Council on Tuesday again decided that the Committee's proposals should have further consideration.

EARLY LAST YEAR an appeal was made through the Chemical Warfare Department to colleagues and friends of the late Lieut. Colonel E. F. Harrison to contribute to a memorial fund for the purposes of presenting a bust or medallion to a scientific institution, and of instituting a medal, prize, or scholarship to be awarded to a young chemist of outstanding ability. As Colonel Harrison had many associations with pharmaceutical chemistry it is now proposed that an additional fund be raised, under the joint auspices of the Pharmaceutical Society and the Pharmaceutical Conference, with the object of adding to the value of the prize or scholarship which formed part of the first scheme. Contributions to this fund may be sent to the honorary treasurer, Harrison Memorial Fund, 17, Bloomsbury Square, W.C.

THE DEATH is announced of Sir Thomas Fraser, Emeritus Professor of Materia Medica in Edinburgh University and Honorary Physician to the King in Scotland, whose research into the action of drugs places him among the pioneers of medical research. It is only as a result of Sir Thomas's research work that it is now possible

to relate the chemical properties of drugs to their action on tissues. The fact that he was a clinical teacher and worker saved him from pitfalls into which others have fallen. He recognised that the action of drugs is no phenomenon of the laboratory, but primarily of necessity in the sick room. He was a Fellow of the Royal Society and held many academical distinctions. In 1898, with Professor Caum Brown, he went to India on a Commission to investigate plague.

IT IS ANNOUNCED that there is a good market in Syria for glassware of every kind. The Germans are trying their utmost to re-capture the market, and a Danish vessel carrying German goods, including glassware, arrived recently at Beyrouth, and sold its cargo advantageously. The method of business is as follows: No credit is given. The rule is cash, 25 per cent. being paid as a deposit in advance on giving the order, and as the buyers urgently require the goods they gladly pay it. Thereupon they open a credit for the full amount at a local bank in favour of the seller, and when the bills of lading arrive the bankers pay the balance and recoup themselves on delivery of the goods to the buyer. This operation is carried out daily by all banks, and chiefly by the Banco di Roma, an active competitor of the French banks.

A LARGE NUMBER OF COMMITTEES are now sitting to consider questions affecting the expansion of industries in India. These include committees on coal production, sugar production and chemical services. In a report by Mr. Trehearne Rees, of Messrs. Forster, Brown & Rees, London, to the Secretary of State on "Indian Collieries," it is stated that one-third of the coal in Indian coal mines is at present being lost by bad methods of mining, while three-quarters of a million tons are lost annually by the wasteful power working of collieries. Regarding the Assam Collieries, Mr. Rees suggests methods for overcoming the sulphuric acid difficulty. He understands that a committee, including those directly interested, will be formed to consider proposals for dealing with the subject after consideration of the report.

THE CIVIL SERVICE COMMISSIONERS announce that an examination will begin on May 4 to fill 10 vacancies for assistant examiners in the Patent Office. The examination will be chiefly confined to candidates who have served in the Forces, and will consist of a qualifying examination, followed by interview by a selection board. The subjects of the qualifying examination are English composition, précis writing, general knowledge, and one of the following:—General chemistry, electricity and magnetism, mechanics and mechanism. The age limits are 20 to 30. The initial salary is £150 a year, with a war bonus. Copies of the regulations and forms of application may be obtained on application to the Secretary, Civil Service Commission, Burlington Gardens, London, W.1. The last day for making application is March 4.

THE LATEST REPORTS respecting the oil-boring experiments in Derbyshire state that of the seven wells sunk only one is yielding oil, namely, that at Hardstoft, near Chesterfield. The flow at this well averages 4,500 gallons weekly. Some time ago, when it was thought desirable to enlarge the yield and to ascertain to what it could be raised, pumping experiments were tried, but it was found that satisfactory results could be secured more easily by a process of baling. It is by this operation that the present yield is being obtained. The result of the boring at the other wells at Ridgeway and Eckington, near Sheffield, Brimington and Brimington Common, near Chesterfield, and Ironville, near Nottingham, will be definitely known in a few weeks. Much water has been met with, and there have been occasional blows of gas, but nothing which gives definite evidence of the presence of oil.

THE DELAY in the distribution of the 650 tons of "reparation" dyes which recently arrived in Manchester, and the reticence of the authorities are, it is stated, causing growing resentment in the textile districts. Apart from the reparation dyestuffs, a report has been freely circulated in the Yorkshire district that a supply of rhodulines has reached England, and applications have been made for them without result, but without contradiction of what may be a rumour. These rhodulines are basic colours and some of the brands are of special interest to the calico printers. It has been stated that the official consignment from Germany contains little of these colours, or of the allied rhodamines. All the official information vouchsafed is that the applications greatly exceed the available supply, and that in the matter both of bulk and "sorts" the applicants must be prepared for disappointment.

WE LEARN from Reuter's Bombay correspondent that there is a big field for dyestuffs in India. In pre-war days all or most of the dyes were imported from Germany, but since the beginning of the war India has been dependent upon the United Kingdom, which has been unable to supply some colours, while in the case of those which are being imported the supply is inadequate to the demand. The United Kingdom has been unable to manufacture or supply several of what are known as the basic colours, with the result that the Government of India has decided to issue licenses to those who want dyes to secure them where they can. On the other hand, some of the dyes manufactured in the United Kingdom, such as sulphur black and red, compete favourably with and even excel the German productions. So far as prices are concerned, the United Kingdom compares favourably with any other country.

CAPT. R. H. MONTGOMERY, of the Fuel Department of the Automobile Association, in an interview with a representative of the *Times*, recently stated that if we only carbonised one-third of our home consumption of coal, instead of paying from £25,000,000 to £30,000,000 a year for imported spirit, we could export motor fuel. In connection with the recommendation of the Fuel Research Board, upon which it has been announced that the Government mean to legislate, to enable gas companies to elect what standard of gas they will supply, and to charge the consumer only for the heat units he obtains, he urged that all companies should be required to extract the whole of the by-products. In the manufacture of electricity also the use of fuel already treated for the recovery of by-products should be insisted upon. The recent Middlesbrough experiments, by which Mr. Ernest Bury had demonstrated the commercial possibilities of the extraction of alcohol from coal oven gas, should have a far-reaching effect.

WITH A VIEW to extracting nitrate of ammonia from surplus stocks of explosives, experiments have been carried out by Professor Garelli, of Turin, on behalf of the Italian Government. From accounts published, it appears that the explosive mixture is placed in special receptacles, a fixed quantity of water added, and the whole allowed to stand. A dense solution of nitrate of ammonia is then formed, which is separated by decantation. Powdered peat is then added to this solution, and after mixing and drying the product thus obtained it becomes a species of manure which is called "nitric peat." This material, which has the appearance of a blackish powder, has the following composition:—Water, 17·8 per cent.; ash, 18·8 per cent.; nitrate of ammonia, 42·8 per cent.; and organic matter, 20·6 per cent. Tests for ascertaining its value as a fertiliser have been carried out in the Alba district of Italy, and the results show that the action of this fertiliser is nearly equal to that of nitrate of soda.

AT THE WEST RIDING QUARTER SESSIONS on Tuesday, Mr. Bramley, on behalf of Messrs. Pilkington Brothers, glass manufacturers, St. Helens, applied for an order to stop up Sandall Lane, Kirk Sandall, and certain footpaths in the area of the Doncaster Rural Distict Council. Mr. Bramley said the company had provisionally purchased between 300 and 400 acres for the purpose of erecting a glass factory, which would give employment to a large number of people. They had applied to the necessary authorities who had agreed that when the works were erected the footpaths and highways in question would become unnecessary. The company had undertaken to keep the highways open as long as possible, and to provide an alternative route if the school were maintained in the same place, and also to assist in paying, if not actually to pay, for the building of a new church, which would cost £9,000. The interests of tenants of small houses would be safeguarded, and they would not have to leave their houses until others were provided. There was no opposition, and the order was made.

AT THE BARROW COLLIERY CHEMICAL WORKS, Barnsley, last week, George Haigh (52), chemical worker, was fatally injured by gas fumes. At the inquest it was stated by John Coles, a fellow worker, that he and Haigh entered a still used for the boiling of tar for pitch making for the purpose of cleaning it. They entered through a manhole and down a ladder. When they reached the bottom Haigh fell, and Coles, guessing he was gassed, shouted for help. Coles added that he felt himself "going" as assistance arrived. George Ward, foreman, said that after the stills were let off they were supposed to stand for 48 hours before they were entered. The men in this case were not ordered to enter them. Two or three men were overcome by gas in trying to reach Haigh. He thought that both gas in the still and gas coming from the next still killed Haigh. A verdict of "Accidental death" was returned, and the Coroner recommended the company to study the general rules for chemical works, which laid down that respirators should be supplied. Apparently that was not done in this case.

THE COUNCIL OF THE SOCIETY OF CHEMICAL INDUSTRY announce that through the generosity of Messrs. Cross & Bevan, and of Sir T. P. Latham, of Weybridge, a prize is again offered for an essay on the inter-connection of economic botany and chemical industry; also a fellowship endowment. The amount of the first prize will be £30, and it will be in the discretion of the Council either to increase this amount in the event of the adjudicators reporting that one essay is of distinguished merit or to award a second and possibly a third prize. A Research Fellowship with the sum of £300, the gift of Sir T. P. Latham, will be awarded to a successful essayist, subject to the following conditions: The £300 will be paid either in two or in three annual instalments (at the discretion of the Council) to such one of the competing essayists as may be judged to be of conspicuous ability, as a grant towards his expenses, on the condition that he apply himself during two or three years respectively to research of approved character on a subject cognate with that discussed in his essay. The immediate object of the donors is to promote the study of economic botany, with a special reference to its bearing on chemical industry, giving the widest possible interpretation of the relationship.

American Notes

Cyanide of Potash Imports

Importations of cyanide of potash during the nine months ended September, 1919, amounted to 720,461 lb., against 141,808 lb. in the same time last year, and 104,204 lb. two years ago.

Bichromate of Soda Prices

Bichromate of soda, the most important of the mordants used in textile colouring, has trebled in price in the American market within the last two months.

Chilian Nitrate Dearer

Nitrate producers in Chile announce an advance in prices to 10s. 6d. per ton, owing to the increase in wages recently granted and to higher railroad rates. It is estimated that 500,000 tons will be sold and shipped this season.

The late Professor Stoddard

Mr. J. T. Stoddard, Professor of Chemistry at Smith College since 1878, who has just died at Northampton, Mass., was a graduate of Amherst College, and had received degrees from German universities.

Retorting Oil from Shale'

Experiments in retorting oil from shale are being made by Capt. W. H. Worsfick, near Santa Ynez, California. It is stated that improvements on the methods employed in Scotland are being worked out.

Glycerin Production Reduced

The output of soap by some of the large plants in the United States has been considerably below the normal, estimates of the curtailment in some cases ranging from 25 to 40 per cent. and over. This means that there has been a corresponding reduction in the output of crude glycerin. Recently the chemically pure grade was advanced by refiners to a basis of 22 cents a pound in drums, and 24 cents in cans and in carload lots. This is the highest price named in recent months and is due to scarcity of coal.

Increasing Use of Low-grade Cyanide

Tests have been made at the laboratory of the Haileybury (Ontario) Mining School of the low-grade cyanide manufactured by the American Cyanamid Co., at Niagara Falls, to ascertain whether it could be successfully employed in the treatment of the silver ore of cobalt. It has been found satisfactory, and the low-grade cyanide is being increasingly used by the mining companies, replacing to some extent the imported high-grade article. It is stated that the American Cyanamid Co. has recently succeeded in improving the grade of its product so as to meet the requirements of the gold mines, and further tests will shortly be made with gold ore from the Porcupine mines.

Nitrogen Products Co.'s New Issue

The American Nitrogen Products Co. is offering $100,000 of its cumulative, participating, non-redeemable 7 per cent. preferred stock, with a par value of $100 a share and exempt from normal Federal income tax. The stock is being offered direct by the company at par with the privilege of arranging for subscriptions on the instalment payment plan. This offering is a part of an authorised issue of $0,250,000, and is for the purpose of adding to present equipment and increasing the capacity of the nitric acid factory of the company. The American Nitrogen Products Co. is a State of Washington corporation, engaged in the manufacture of nitrogen products from the air, and at present is operating two plants, one producing nitrite of soda and the other nitric acid. The company owns and controls, for the entire Western Hemispheres, valuable patents for the processes of fixation of nitrogen granted by the United States and Canada.

Fellowship for Glycerine Research

An American manufacturer has established a fellowship at the Mellon Institute of Industrial Research, Pittsburgh, for the purpose of extending the industrial uses of glycerine. It is expected that this investigation will be concerned primarily in the use of glycerine to replace alcohol in the flavouring extract and allied industries. It is hoped that the results of this glycerine fellowship may be brought to the attention of industrialists by co-operation with various associations. According to the Mellon Institute system of research, an industrialist, a company, or an association of manufacturers having a problem or group of problems requiring investigation may become the donor of an industrial fellowship by contributing to the Mellon Institute a definite amount of money, for a period of not less than one year. This foundation sum must be adequate for the purchase of all necessary special apparatus or other equipment as well as for the annual stipend of the research man or men selected to work on the particular problem. All results obtained during the course of the Industrial Fellowship belong exclusively to the donor.

Positions for "Demobbed" Chemists

An organised effort is being made in the United States to provide appointments for chemists who have been engaged in chemical warfare work. In an appeal to chemical manufacturers to employ men who have served the Government, Major F. M. Crossett, of the Chemical Warfare Service Department, writes: "Many men are being discharged from the army who, before entering service, were engaged in work requiring chemical or technical education and experience. Nearly all are college or technical school graduates with practical experience. They also have had the benefit of army training and discipline, and, in some instances, the handling of men, research work, or chemical engineering. Some of them are anxious to secure employment. To help them the Relations Section of the Chemical Warfare Service is acting as a clearing house. From the applicants (from all over the country) there is a rare opportunity to select splendid men of exceptional ability, who are well qualified to fill any place requiring chemical or technical knowledge and experience. Some seek places as managers, engineers, superintendents, plant operators, foremen, supervisors and salesmen. When men are wanted preference should be shown to those who have served their country in the war. We have them from $1,200 to $12,000 a year. A line to the Director of Chemical Warfare Service, Washington, D.C., will bring prompt attention."

American Soap for Norway

According to *Drug and Chemical Markets* the United States is giving attention to the soap market in Norway. Beginning, it states, with 1916, England's inability to furnish soap for export in sufficient quantities caused Norwegian consumers to look to the United States for their needed supplies, and American soaps were introduced on a quantity basis. This trade reached its maximum in the years ending June 30, 1916 and 1917. With the entry of the United States into the war and the establishment of restrictions on exports and shipping, the trade was much reduced and England gained a high percentage. This percentage must, however, be considered in the light of the greatly reduced total imports in the year ending June 30, 1918. The Norwegians are very conservative in many lines. If an article has won favour, the trade prefers to keep on using it rather than venture into new lines. This is true of soap as well as of other commodities. During the past 25 years certain European soap companies have had their products in the Norwegian market, and their brands have become well known through persistent advertising and sales campaigns. Although many classes of American soap have now won a place in the Norwegian market, a careful follow-up campaign is necessary if they are to hold the position won. There seems to be a good opening for some special classes of soaps, such as soap powder and flakes, scouring soaps, cleaners and cleansers, in addition to soaps adapted to use by mechanics and sea workers, and floating soaps for the toilet, bath, and fine laundry.

Bureau of Chemistry's Research Work

Dr. Carl L. Alsberg, chief of the United States Bureau of Chemistry, in his annual report (a similar document to that of the British Government Chemist) reviews the work done in enforcing the Federal Food and Drugs Act, improving methods of food distribution, finding uses for waste products, the development of technological processes in industry, and results obtained from chemical research. The first complete and critical survey of the fat and oil industry of the United States was made and the results, with statistics of the industry, have been published. For the purpose of conserving sugar, a number of substitutes were investigated and methods developed for using various substitutes in the manufacture of soft drinks. Sugar substitutes for use in baking and cooking were also recommended. Corn cobs, one of the largest waste by-products of farming, may now be utilised as the result of processes which have been worked out and patented for the preparation from corn cobs of adhesive gum and of the rare sugar xylose. Processes for converting xylose into substances which may be useful commercially have been patented and published. Cull oranges and lemons not suitable because of size, shape, or defects for shipment as fresh fruit are used for the manufacture of many useful foods and chemicals. A citrus by-products laboratory, operated by the Bureau of Chemistry at Los Angeles, has worked out new methods for the manufacture of marmalade, vinegar, candied peel, juice, citrate of lime, citric acid and other products. As a result of this work, a profitable citrus by-products industry has been established on the Pacific Coast. Work to improve existing methods for the manufacture of starch from cull and surplus potatoes is under way. Methods for the manufacture of syrup on a small scale from sweet potatoes have been published.

Practical results are reported in connection with the development of the production of dyes, leather, naval stores, paper fabrics and insecticides, in addition to the technological work on foods. New processes for the manufacture of sensitising dyes have been discovered and patent applications filed. A new dye of great value to physicists has been prepared. The new method for the production of phthalic anhydride, a valuable dye intermediary, is in successful and commercial use. A new photographic developer has been produced and the process published. Reports on the production of naval stores, including gum rosin and gum turpentine, wood rosin and wood turpentine, have been published. Specifications on the properties, the sampling and the laboratory examination of turpentine have been prepared. Equipment to produce insecticides and fungicides on a semi-commercial scale has been secured in order that manufacturing processes may be improved and that new types of useful insecticides and fungicides may be devised. Methods for the manufacture of calcium arsenate have been published.

Royal Warrants to Tradesmen

THE following are included in the List of Tradesmen who hold Warrants of Appointment either to King George V., the Queen, the late Queen Victoria, the late King Edward or Queen Alexandra, with Authority to use the Royal Arms. These Warrants do not carry the right to fly the Royal Standard, or to the use of the word "Royal":—

Allen & Neale	Chemists	King's Lynn.
Beken & Sons, Alfred E.	Chemists & Druggists	Cowes.
Bentley, Joseph, Ltd.	Manufacturers of Horticultural Chemicals	Barrow-on-Humber, Hull.
Borax Co., The Patent, Ltd.	Patent Borax Manufacturers	London.
Buddles, William	Chemist	London.
Budgen & Co., Ltd.	Oilery & Tallow	Windsor.
Clay & Abraham	Chemists	Liverpool.
Cook & Co., Edward	Soap Manufacturers	London.
Corbyn, Stacey&Co.,Ltd.	Chemists	London.
Crosfield & Sons, J., Ltd.	Soap Manufacturers	London.
Davidson & Kay	Chemists	Aberdeen.
De Castro & Wilson	Chemists	London.
Dublin Pure Ice & Cold Storage Co.	Ice	Dublin.
Earle, G. T. (1912), Ltd.	Cement Manufacturers	Hull.
Evans, John	Chemist	Dublin.
Ferris & Co.	Chemists & Druggists	Bristol.
Fison & Co., Ltd., Joseph	Chemical Fertilisers	Ipswich.
Frazer & Green, Ltd.	Chemists	Glasgow.
Furnival, Stephen	Chemist	Windsor.
Gibbs, D. & W., Ltd.	Soap Manufacturers	London.
Graham, Walter & Co.	Oil Cake	Greenwich.
Hewett & Sons	Chemists	Brighton.
Hewitt & Son	Oilery, Tallow, &c.	Cowes, I.of Wight
Hogg, Robert & Son	Drugs	London.
Hogg, W. D., M.D.	Chemist	Paris.
Jeye's Sanitary Compounds Co., Ltd.	Manufacturers of Disinfectants	London.
Kent, George, Ltd.	Refrigerators	London.
Knight, John, Ltd.	Soap Manufacturers	London.
Lever Brothers, Ltd.	Soap Manufacturers	London.
Metcalfe & Son	Chemists	Hull.
Newman, James	Artists' Colourman	London.
Newton, Chambers & Co., Ltd.	Manufacturers of Disinfectants	Thorncliffe, near Sheffield.
Nixey, William G., Ltd.	Black Lead Manfacturers	London.
Norton & Co.	Chemists	Cairo.
Odham's NitroPhosphate & Chemical Co., Ltd.	Chemical Manures	London.
Oldham, William	Suppliers of Photographic Chemicals.	Eton.
Palmer & Co., Ltd.	Candle & Night Lights	London.
Pears, A. & F., Ltd.	Soap Manufacturers	London.
Pope, Roach & Son	Chemists	London.
Purimachos, Ltd.	Cement Manufacturers	Bristol.
Roberts & Co.	Chemists	London.
Russell & Co.	Chemists	Windsor.
Savory & Moore, Ltd.	Chemists	London.
Scott, H. & Sons	Horticultural Chemicals	London.
Scott, Thomson, R. & Co. Ltd.	Chemists	Calcutta.
Scrubb & Co., Ltd.	Scrubb's Ammonia	London.
Smith, Stanistreet & Co.	Chemists	Calcutta.
Squire & Sons, Ltd.	Chemists and Druggists upon the Establishment in Ordinary.	London.
Squire, Frank R.	Chemist	San Remo.
Thorley, Joseph, Ltd.	Cattle Food	London.
Tytler, William W.	Chemist	Ballater.
Vinolia Co., Ltd.	Soap Manufacturers	London.
Warehousing Co., Ltd.	Feeding Oil Cake	Hull.
Waterloo Mills Cake	Waterloo Round	
Waugh, George & Co.	Chemists	London.
Whitfield & Son	Chemists	Scarborough.
Winsor & Newton, Ltd.	Manufacturing Artists' Colourmen.	London.

Workmen's Compensation

THE Workmen's Compensation (War Addition) Act, 1919, which was passed at the end of last Session, came into operation on Thursday, January 1. As from that date the amount of the additional weekly sum (known as "the war addition") payable under the Workmen's Compensation (War Addition) Act of 1917 to workmen who are entitled to weekly payment of compensation on account of total disablement, was increased from one-quarter to three-quarters (75 per cent.) of the weekly payment. This increase is payable, not only in cases arising after the new year, but also in all existing cases of total disablement in which weekly payments are being made under the Workmen's Compensation Acts.

Chemical Trade Inquiries

The following inquiries, abstracted from the "Board of Trade Journal," have been received at the Department of Overseas Trade (Development and Intelligence), 35, Old Queen Street, London, S.W.1. British firms may obtain the names and addresses of the inquirers by applying to the Department (quoting the reference number and country), except where otherwise stated.

Locality of Firm or Agent.	Materials.	Ref. No.
Switzerland (Zurich)	Chemicals and Dyestuffs	—
Spain (Valencia)	Chemical Fertilisers	—
Mexico	Chemicals and Dyes	—
Canada (Montreal)	Phosphate	—
Belgium (Antwerp)	Potash and Industrial Oils	—
France	Chemical Products; Tannery Products	—
Nantes	(11) Portland Cement; Heavy Hydraulic Lime (13) Fats and Oils for Soap-making; Copra (16) Raw Materials for Soap-making; Oils; Palm Butter (18) Ground Nut Oils	—

Government Contracts

THE following contracts were placed by the Government during November:

India Office; Stores Department

Bismuthi Carbonas: Howards & Sons, Ilford.
Magnesium Powder, &c.: D. Greenhalgh & Son, London, E.C.
Oil, Castrol: C. C. Wakefield & Co., London, E.C.
Oleum Cajaputi, &c.: Stafford, Allen & Sons, London, E.C.
Potassii Iodidum, &c.: Howards & Sons, Ilford.

Crown Agents for the Colonies

Bismuth Subnit, &c.: Howards & Sons, Ltd., Ilford.
Camphor: Whiffen & Son, London, E.C.
Cement: Wouldham Cement Co., London, E.C.
Copra Drying Machine: Tyneside Foundry & Engineering Co., Low Elswick, Newcastle-on-Tyne.
Oil, Linseed and Turpentine: Stanley, Earle & Co., Hull.
Oil Linseed, &c.: Sir W. A. Rose & Co., Ltd., London, E.C.
Oleum Recini: Premier Oil Extracting Co., Hull.
Oleum Terebinth: Prices Co., Ltd., Battersea.
Potase, Iodid, &c.: Howards & Sons, Ltd., Ilford.
Quinine: Howards & Sons, Ltd., Ilford.

Tasmanian Sulphide Ores

THE Tasmanian Government has entered into a tentative agreement with the directors of the Read-Rosebery Mining Co. for the supply of 15,000 H.P. of electric current for the treatment of the sulphide ores of the West Coast of Tasmania. Zeehan, where it is proposed to erect the treatment works, is the most convenient centre from which to carry on operations upon the West Coast ores, which contain zinc, lead and copper, together with silver and some gold. The quantity of ore available in the mines at present controlled by the company has been estimated at 1,004,000 tons, assaying 27·4 per cent. zinc, 7·3 per cent. lead, 9·5 oz. silver, and 0·127 per cent. of gold. The treatment, the *Times Trade Supplement* states, consists of roasting the crude material, and then extracting the zinc by the use of sulphuric acid and water. The solution containing these is purified by using limestone, &c., to remove iron and other deleterious elements, so that as far as possible the final solution shall consist of water, zinc, and sulphuric acid. The lead, copper, gold and silver are collected as residues from the original leach solution, and are treated separately by smelting. The purified liquid is then electrolysed in cells or tanks, similar to those used in copper refining by the electrolytic method. The zinc (or spelter) is obtained in the form of what is termed "Cathode sheet," a metallic deposit upon an aluminium plate, which is held in position in the tank. After stripping, the sheets are melted and cast into slabs, known in the trade as electrolytic spelter. The carrying out of the scheme is contingent upon the company raising the necessary capital, the works being estimated to cost about £750,000.

References to Current Literature

Only articles of general as distinct from specialised interest are included and given in alphabetical order under each geographical subdivision. By publishing this digest within two or three days of publication or receipt we hope to save our readers time and trouble; in return we invite their suggestions and criticisms. The original journals may be consulted at the Patent Office or Chemical Society's libraries. A list of journals and standard abbreviations used appeared in our issue of December 27 last.

British

ACETONE. The production of normal butyl alcohol and acetone by the fermentation of horse chestnuts. A. Gill. *J. Soc. Chem. Ind.*, December 31, 411-412T. An account of experiments carried out at H. M. Factory, King's Lynn.

ANALYSIS. Estimation of *p*-phenylenediamine. T. Callan and J. A. R. Henderson. *J. Soc. Chem. Ind.*, December 31, 408-410T. The method used is based on the interaction of the amine with chlorine.

The estimation of sulphates in the presence of organic sulphonic acids. T. Callan, J. A. R. Henderson and R. Barton. *J. Soc. Chem. Ind.*, December 31, 410-411T.

ASPHALT. Trinidad Lake Asphalt. *J. Roy. Soc. Arts*, January 2, 109-110. A short account of the history and progress of the Trinidad asphalt industry.

CHARCOAL. Some chemical characters of ancient charcoals. T. C. Cantrill. *Archæologia Cambrensis*, July, 365,392.

COAL. Note on the determination of sulphur and ash in coal. *Gas World*, January 3, 5.

DIAMONDS. Experiments on the artificial production of diamond. *Phil. Trans.*, December 10, 67-107. Bakerian lecture delivered before the Royal Society on April 25, 1918.

GAS. Inerts in town gas and a heat value selling basis. N. H. Humphrys. *Gas World*, January 3, 4. The subject is discussed from the manufacturers' point of view.

Some carbonising variations effected by temperature changes in the top of the coking chamber. A. H. Middleton. *Gas World (Coking Sect.)*, January 3, 13-17. An account of results obtained at the Langley Park Coke Works of the Consett Iron Co.

LEAD. The influence of impurities in lead on its behaviour when heated with concentrated sulphuric acid. C. E. Barrs. *J. Soc. Chem Ind.*, December 31, 407-408T. (*See* CHEMICAL AGE, December 6, 1919, p. 665.)

MINERALS. The Imperial Mineral Resources Bureau. S. J. Truscott. *J. Soc. Chem. Ind.*, December 31, 469-470R. A statement of some of the work proposed to be carried out by the Bureau.

VACUA. New development in high vacuum apparatus. G. L. E. Kotheny. *Engineering*, January 2, 28-31. A Paper read before the Society of Naval Architects and Marine Engineers, New York.

WAR GASES. The manufacturing of lethal gases in Germany. F. H. Carr. *J. Soc. Chem. Ind.*, December 31, 468R.

History of mustard gas. A. G. Green. *J. Soc. Chem. Ind.*, December 31, 469R. A reply to W. J. Pope. (*See* CHEMICAL AGE, 1919, p. 671.)

Colonial

GLUE. Manufacture of glue in the tropics from tannery refuse. K. C. Stinivasan, Dept. of Industries, Madras, 24 pp. Methods of working suitable for tropical climates have been developed.

United States

ALCOHOL. A short bibliography of sulphite alcohol. C. J. West. *Paper*, December 3, 20-21, 23. Useful list of papers and patents on the production of alcohol from sulphite-cellulose waste liquors.

COTTONSEED OIL. History and development of the cottonseed oil industry. D. Wesson. *Chem. & Met. Eng.*, November 26-December 3, 661-662. A Paper read before the December Meeting of the American Institute of Chemical Engineers.

ELECTRIC FURNACES. Melting of some non-ferrous metals and their alloys in the electric furnace. E. F. Collins. *Chem. & Met. Eng.*, November 26-December 3, 673-679. A description of the contact arc resistance type of furnace and its use.

The Söderberg self-baking continuous electrode. J. W. Richards. *Amer. Electrochem. Soc.*, April, 1920 (advance copy), 15 pp. A description of an electrode which is baked in the furnace in which it is used.

A furnace temperature regulator. W. P. White and L. H. Adams. *Phys. Rev.*, July, 44-48. A sensitive electric furnace regulator, effective under extreme conditions, is described.

GLASS. Use of optical pyrometers for the control of optical glass furnaces. C. N. Fenner. *Bull*, 151, *Amer. Inst. Min. Met. Eng.*, 1011-1011.

Thermocouple installation in annealing kilns for optical glass. E. D. Williamson and H. S. Roberts. *Bull.* 152, *Amer. Inst. Inst. Min. Met. Eng.*, 1445-1453.

METALS. A simplification of the inverse-rate method for thermal analysis. P. D. Merica. *U.S. Bur. Standards, Sci. Paper*, 336, 4 pp.

The author describes the technique of recording data as to transformations in metals and alloys.

ORGANIC COMPOUNDS. Commercial possibilities in the electrochemical production of organic compounds. C. J. Thatcher. *Chem. & Met. Eng.*, November 26-December 3, 663-666.

PERMANGANATE. Potassium permanganate from ferromanganate by electrolysis. M. de K. Thompson. *Chem. & Met. Eng.*, November 26-December 3, 680-681. The possibility of the process, using ferromanganese with 75 per cent. mm., is shown.

PYROMETRY. Potentiometers for thermo-element work. W. P. White. *Bull.* 153, *Amer. Inst. Min. Met. Eng.*, 1761-1772. Suitable apparatus for use in the accurate reading of pyrometers is discussed.

RESEARCH. Industrial research in small establishments. M. E. Leeds. *Chem. & Met. Eng.*, November 26-December 3, 690-691.

SULPHURIC ACID. The thermal problem in contact sulphuric acid manufacture. F. C. Zeisberg. *Proc. Amer. Electrochem. Soc.*, September, 195-202.

German

IRON. Estimation of gases in iron. P. Oberhoffer and A. Beutell. *Stagl u. Eisen*, December 18, 1584-1590. A new apparatus for estimating gases in iron and other metals is described and an account given of results obtained.

Miscellaneous

ANALYSIS. Indirect electrolytic analysis of anions without the use of platinum electrodes. E. Lasala. *Anal. Soc. Espan. Fis. Quim.*, October, 235-247. The determination of a number of acidic radicles and the separation of iodine and chlorine are dealt with.

Determination of the melting point of any hygroscopic substances. H. J. Bacher. *Chem. Weekblad.*, December 20, 1564-1565.

Apparatus for the volumetric determination of small quantities of carbon dioxide. A. Constantino. *Atti. R. Accad. Lincei.*, Vol. 28, Nos. 3-4, 118-121.

CEMENT. Magnesia-cements. A. Slettbacher. *Schweiz. Chem. Zeit.*, 1919, Nos. 20-21. 198-201. An account of the reactions involved and the properties and uses of the products.

Contracts Open

ARTIFICIAL MANURES; MOTOR SPIRIT.—For the Metropolitan Asylums Board. Particulars from the Offices of the Board, Embankment, E.C. Tenders by January 13.

TAR.—For Lambeth Borough Council. Particulars from H. E. Anderson, C.E., Borough Engineer, Lambeth Town Hall, Brixton Hill, S.W. 2.

(a) PITCH.—Particulars from J. M. McElroy, General Manager, Corporation Tramways, 55, Piccadilly, Manchester. Tenders by January 13.

(3) SECTION A, Paints; Section B, Varnishes; (7) petroleum oil; (14) carbolic powder; (15) Portland cement; (16) Section A, lubricating oils; Section B, fuel oil; (17) tar and pitch, including refined tar for use in the construction of tarred macadam roads and for tar spraying; (19) explosives; (22) Soap (yellow, carbolic, toilet and soft); (24) creosote; (28) disinfectant fluid; (30) linseed oil, turpentine and turpentine substitute; (33) benzoline and motor spirit; (36) ship chandlers' goods.—For Plymouth Mental Hospital. Particulars from T. Pierson Frank, Borough Engineer and Surveyor, Municipal Offices, Plymouth. Tenders by January 17.

Recent Wills

Mr. F. W. P. Preston, of 25, Stanley Avenue, Birkdale, Southport, distiller, managing director of Preston's (Liverpool) Distillery Co., Ltd..... £26,156

Mr. R. J. Smithson, of Heckmondwike, dyer and finisher, aged 65 ..... £17,078

Book Received

POPULAR CHEMICAL DICTIONARY. By C. T. Kingzett, F.I.C. Bailliere, Tindall & Cox, London. Pp. 368.

Patent Literature

We publish each week a list of selected complete specifications accepted as and when they are actually printed and on sale. In addition, we give abstracts within a week of the specifications bein g obtainable. Readers can thus decide what specifications are of sufficient interest to warrant purchase, the only way of obtaining complete information. A list of International Convention specifications open to inspection before acce ptance is added, and abstracts are given as soon as possible.

Abstracts of Complete Specifications

122,170. PIGMENT ZINC OXIDE, PREPARING. American Zinc, Lead & Smelting Co., 55, Congress St., Boston, Mass., Assignees of L. E. Wemple, 1001, Pierce Building, St. Louis, Mo., U.S.A. International Convention date (U.S.A.), January 9, 1918.

Crude zinc oxide is prepared from zinc-bearing material in the presence of sufficient sulphur to convert the lead, cadmium and zinc into sulphates. To eliminate the soluble zinc sulphate, the material is mixed with 1 to 2 per cent. of a reducing agent, such as lampblack, and heated in a muffle furnace to 900°-1,200°F., preferably 1,100°F. Under these conditions the zinc sulphate only is reduced to the oxide. The material may then be stirred with free access of air to burn away the excess of lampblack. Alternatively, the zinc sulphate may be reduced wholly or partly by lead oxide or cadmium oxide, which are thus converted into sulphates. It is possible by this process to eliminate up to 4 to 5 per cent. of zinc sulphate without producing lead oxide or cadmium oxide in the finished product, and without affecting the grain of the material or other properties necessary to enable it to be used as a pigment.

124,762. AMMONIA, APPARATUS FOR THE SYNTHETIC PRODUCTION OF. General Chemical Co., Assignees of F. W. de Jahn, 25, Broad Street, New York. International Convention date (U.S.A.), November 3, 1917.

The apparatus is for effecting the combination of atmospheric nitrogen, previously purified and dried, with hydrogen by passing the mixture over a catalyst. The reaction vessel consists of a cylinder of chrome vanadium steel, or tungsten steel, screw-threaded and provided with a cover at each end. The covers are retained in position by screwed rings, and each has a central opening closed by a smaller plate, which is bolted on to the cover. The catalytic material is contained in a number of tubes arranged longitudinally in an inner shell. The hot mixed gases first pass upward over the tubes and then downward through them, and thence to a heat interchanger, where they give up heat to the incoming gaseous mixture. The heat interchanger consists of a vertical cylinder containing a number of vertical tubular units. Each unit comprises three concentric tubes forming two concentric annular passages of small bore through which the outgoing hot gases and the incoming cold gases pass in opposite directions.

134,521. ALCOHOL, MANUFACTURE OF. Elektrizitätswerk Lonza, Gampel (Canton du Valais), and 72, Aeschervorstadt, Basle, Switzerland. International Convention date (Switzerland), October 27, 1918.

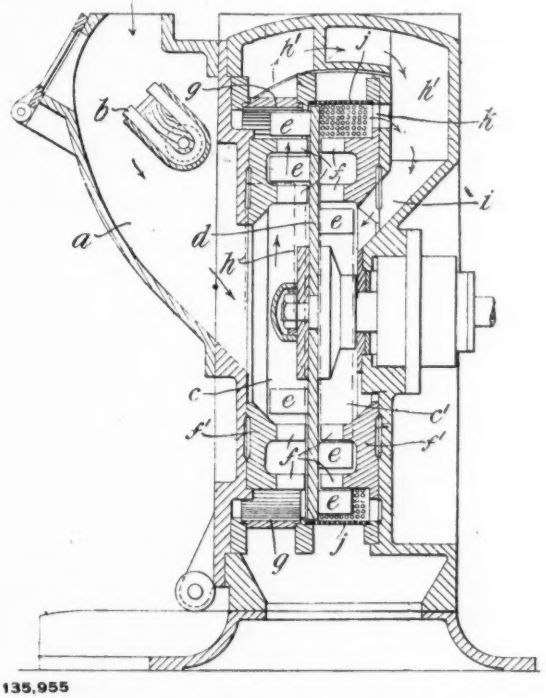
Ethyl alcohol is produced by the catalytic reduction of acetaldehyde by means of an excess of hydrogen. It is known that a high yield of alcohol is obtained by a complete exclusion of oxygen, but ether is then formed; further, when a large excess of hydrogen is used an accumulation of methane and carbon monoxide and dioxide is gradually produced by the decomposition of the acetaldehyde, and the yield of alcohol is then diminished. It is now found that both these difficulties may be avoided by using an excess of hydrogen with the addition of oxygen up to 0·3 per cent. A yield of 98 per cent. of alcohol may then be obtained, the proportions of ether and aldehyde being very small. The temperature is maintained between 90°C. and 170°C., and the heat of the reaction may be wholly or partly removed from the circulating gases by cooling, after separation of the alcohol. Alternatively, the heat may be removed by using a large excess of hydrogen.

135,889. ATMOSPHERIC NITROGEN, PROCESS FOR EFFECTING FIXATION OF—AND THE PRODUCTION OF AMMONIA. E. W. Haslup, 82, Beaver Street, New York. Application date, October 24, 1918.

A furnace of the blast or producer type is charged with a mixture of coke and feldspar, lime, magnesia, or other oxide, the coke being 30 to 40 per cent. above that theoretically necessary to carry out the reactions. Producer gas is formed, and the gases containing cyanamide are drawn off at a temperature of about 1,400°C., out of contact with air, and conveyed to a scrubber to which water is supplied. The cyanamide reacts with the water, producing a carbonate and ammonia, and the gases are passed to a saturator containing sulphuric or nitric acid to absorb the ammonia. *See also* 134,885 (THE CHEMICAL AGE, Vol. I., p. 726). Reference is directed in pursuance of Sec. 7, Sub-sec. 4, of the Patents and Designs Act, 1907, to Specifications 4,037/1893, 16,760/1893, 18,792/1894, and 10,305/1907.

135,955. IMPACT GRINDERS. W. S. Barron and G. S. Barron, Ladybellegate Street, Gloucester. Application date, December 6, 1918.

The material to be ground is fed into a spout *a*, which contains a magnet *b*, and passes thence to the chamber *c*. This chamber is separated from a similar chamber *c'* by a disc *d*, rotating at high speed and carrying projecting studs or beaters *e*. The side walls of the chambers *c*, *c'* carry two rows of studs *f*, between which the studs *e* revolve. The circumferential walls of the casing *g* are provided with teeth, and the material is ground by impact. The material then passes through a circumferential opening to passages *h'*, *i*, and thence to the chamber *c'* for further grinding. The fine material passes out through the screen *j*, and the coarser material passes through the passage *k* back to the chamber *c'*.



135,955

135,968. LEAD AND SILVER FROM SULPHIDE ORES AND METALLURGICAL PRODUCTS, RECOVERY OF. Amalgamated Zinc (De Bavay's) Ltd., 360-366, Collins Street, Melbourne, and S. Ganelin, 357, Eastern Parkway, Brooklyn, New York. Application date, December 12, 1918.

The process is for the recovery of lead and silver from crude

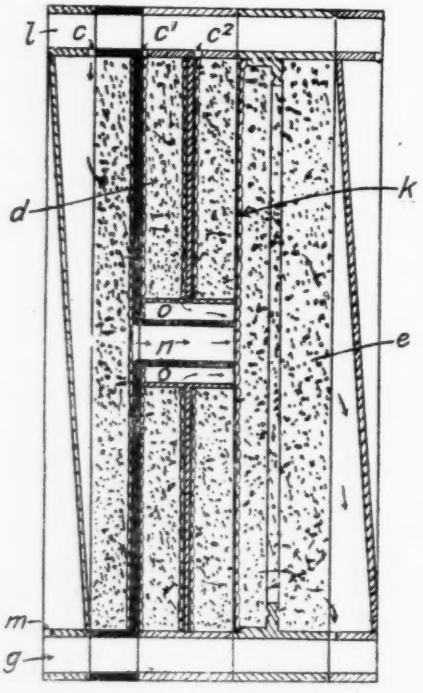
sulphide ores containing lead, silver and zinc, and for treating concentrates, &c. Sufficient zinc chloride is added to convert all the lead, silver, antimony, tin and arsenic into chlorides. This is effected by heating the ground mass to 400°C. to 500°C. with continuous mixing, when the chlorides of arsenic, antimony and tin are volatilised and removed. To extract the lead and silver together, the residue containing the mixed chlorides is leached with cold concentrated brine or sodium thiosulphate, the temperature being as low as possible and the period of contact of the materials as short as possible, to avoid conversion of the lead and silver chlorides back into sulphides. To extract the lead and silver separately the residue may be leached with hot concentrated brine containing 3 to 4 per cent. of zinc chloride, which dissolves the lead chloride and allows the conversion of the silver chloride into sulphide. The later may then be extracted with cyanide solution, or brine containing 2 to 4 per cent. of ferric chloride. Alternatively, the lead chloride may be first extracted with hot water, and then the silver with a cold solvent. The lead chloride may be added to a bath of molten zinc chloride and metallic lead, and metallic zinc then added. The lead chloride is reduced to lead, and successive additions of lead chloride and zinc are then made. The metallic lead and the zinc chloride are tapped off alternately. Alternative methods of extracting the lead and silver are also described.

135,969. Lactose or Milk Sugar, Manufacture of. G. Martin, The Co-Operative Wholesale Society, Ltd., 109, Corporation Street, Manchester. Application date, December 13, 1918.

Specification 135,614 (*see* The Chemical Age, Vol. II., p. 22), describes the preparation of pure lactose from whey by precipitating the albumen with metaphosphoric acid. It is now found that tannic acid, mercurous nitrate, phosphotungstic acid, magnesium sulphate, or mixtures of these, also act as precipitating re-agents.

135,976. Filter Presses. R. W. Webster, 20, Finchley Way, Finchley, London, N.3. Application date, December 17, 1918.

Filters comprising a number of filtering discs are provided with one or more preliminary filtering discs to lessen the amount of deposit on the main filtering discs. The filter is built up from a number of frames provided with openings 1 and *g*, which form supply and discharge conduits in the built-up structure. Three preliminary filtering discs *d* are shown separated by partitions, and the liquid is supplied to them through the openings *c*, c^1, c^2. The discharge from these discs takes place through the passages *n*, *o*, and directly through the gauze disc *k*, to the main filtering disc *e* and the filtered liquid finally passes through the openings *m* to the conduit *g*. Other modifications are described including two in which regulating valves are used.



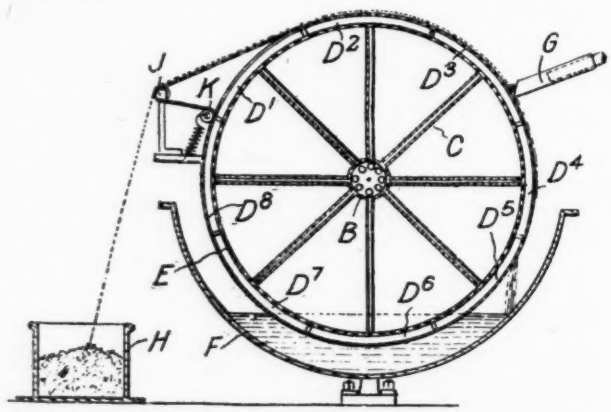
135,976

135,987. Ortho- and Para-Toluene-Sulphochlorides, Process for Separating. F. E. Matthews, 211, Adelaide Road, Swiss Cottage, London, N.W.; and E. H. Strange, 50, City Road, London, E.C. Application date, December 20, 1918.

A mixture of ortho- and para-toluene-sulphochlorides is obtained by treating toluene with sulphuric acid chlorhydrine, cooling the mixture to about —20°C., and separating the para compound which crystallises. The mixture of ortho and para compounds, which contains 60 to 70 per cent. of the ortho compound, is cooled to about —6°C., and a crystal of ortho-toluene-sulphochloride is added. Part of the ortho-sulphochloride then crystallises and may be separated. The process may be used to obtain this compound for use in the manufacture of saccharin.

135,992. Separating Solid Particles of Matter from Liquids, Apparatus for. W. Acton, Mossvale Cottage, Greenock Road, Paisley, Scotland. Application date, December 30, 1918.

A hollow rotating shaft B carries a drum provided with circumferential chambers D^1, D^2, D^3, D^4, D^5, D^6, D^7, D^8, bounded by stout mesh E. Each chamber is connected by a radial tube C to a separate longitudinal tube within the shaft B. An endless band of filtering fabric passes over the drum and the guide rollers J, K, and the liquid to be filtered is fed on to the band by a nozzle G. The drum rotates in a tank F, also containing the liquid. Suction is applied to those chambers which are under the filtering band, through the tubes C, B, under the control of a rotary valve at the end of the shaft. The solid material is deposited on the filtering band, and the resulting cake is detached on passing over the roller J, and then deposited in the receptacle H. Reference is directed in pursuance of Sec. 7, Sub-sec. 4, of the Patents and Designs Act, 1907, to Specifications 19,600/1890, 2,257/1891, 1,591/1892, 9,956/1898, 22,871/1898, 19,237/1901, 22,852/1901, 10,071/1904 and 120,055.

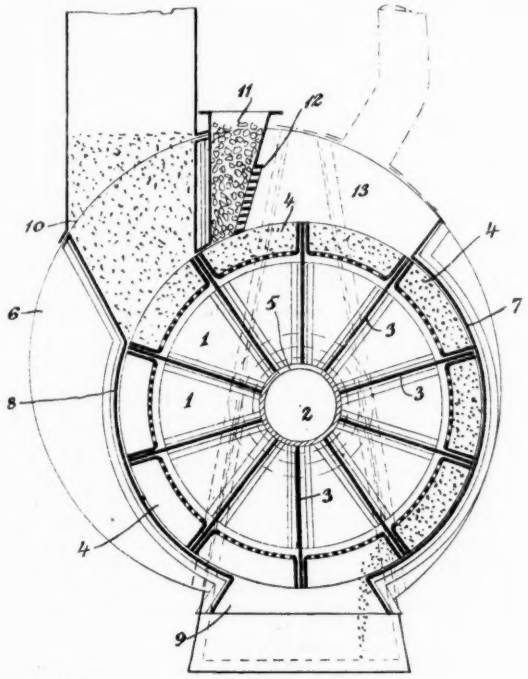


135,992

136,076. Sintering Concentrates, Distilling Shale and the Like, Apparatus for. J. M. Berglund, Ludvika, Sweden. Application date, April 17, 1919.

A cylinder 1 is mounted on a stationary shaft 2 and provided with radial partitions 3. Removable open-topped sintering pans 4, having perforated bottoms, are arranged around the periphery. The cylinder is partly bounded by side covers 7, 8, as shown, and a charging funnel 10 is provided at the top. The cylinder is slowly rotated, and suction is applied to the shaft 2, which has transverse slots 5, extending over two compartments. The material to be sintered is mixed with fuel and is ignited when passing the chamber 11 filled with

burning fuel. The burning mixture is exposed to the air when passing the opening 13, the air being drawn through to the shaft 2. The sintered or distilled material is finally discharged through the opening 9 at the bottom.



136,076

International Specifications Not Yet Accepted

134,522. ANTHRAQUINONE. Barrett Co., 17, Battery Place, New York. (*Assignees of J. M. Weiss, 210, West One Hundred and Tenth Street, New York, and C. R. Downs, Cliffside, N.J., U.S.A.*). International Convention date, November 1, 1918.

Anthracene vapour is mixed with oxygen or an oxygen containing gas and passed through tubes heated to 300-500°C. containing a vanadium compound such as the oxide. The anthracene is thereby oxidised to anthraquinone.

134,531. ALUMINA. Norsk Hydro-Elektrisk Kvaelstofaktieselskab, 7, Solligatan, Christiania. International Convention date, October 26, 1918.

Labradorite is treated with acids, and the aluminium salts are precipitated with ammonia at a pressure of 10-15 atmospheres. The alumina is recovered by filtration, and the ammonium salt is treated with a further quantity of labradorite to reproduce ammonia for further use in the first part of the process.

134,536. PRECIOUS METALS; SELENIUM AND TELLURIUM. M. Chikashige, 462, Makatachiuridori-Shinmachi-Higashiiru, Sanchomachi; and D. Uno, 15, Goshonouchi, Okazakicho, both in Kyoto, Japan. International Convention date, October 28, 1918.

Metallurgical flue dust, electrolytic slimes, &c., which contain precious metals, selenium and tellurium, are fused with metallic lead, and an alkali hydrate, carbonate, or nitrate. Three layers are formed, the lowest being a lead alloy of the precious metals which are then recovered by any suitable means, such as cupellation. The uppermost layer contains the selenium and tellurium, which are recovered by dissolving the material, neutralising the alkali with acid and agitating with air. Some of the selenium and tellurium are then precipitated, and the remainder may be precipitated by passing sulphur dioxide through the residual liquid.

LATEST NOTIFICATIONS.

136,829. Organic Matter, Treatment of, for Fertiliser Purposes. A. J. Grinnell and B. Field. April 27, 1917.

136,831. Pulveriser, Rotary. Soc. Milanese Impianti Industriali Cortese-Crespi-Squassi. December 17, 1918.

136,833-4. Ammonia, Process for Recovering, from Coke Oven and like Gases. Soc. Industrielle de Produits Chimiques. May 27, 1918.

136,837. Gaseous Mixtures Liquefiable at very Different Temperatures, Separation of the Constituents of. Soc. l'Air Liquide (Soc. pour l'Etude et l'Exploitation des Procedes G. Claude). February 4, 1914.

136,841. Soda Containing Water of Crystallisation or Mixtures Thereof with other Substances, Process for Producing. A. Welter. March 23, 1918.

137,030. Paraffin, Process for Converting, into Acids. Pardubitzer Fabrik der Akt.-Ges. fur Mineralol-Industrie vorm. D. Fanto & Co. December 27, 1918.

137,034. Double Decomposition of Substances, Process for the. L. M. E. Wang. December 23, 1918.

137,036. Ammonia, Methods and Apparatus for the Oxidation of. C. Toniolo. December 23, 1918.

137,045. Distillation and Refining of Volatile Substances, and the Carbonisation and Coking thereof. Processes for the. M. J. Berg. December 21, 1918.

137,052. Evaporating Apparatus. Soc. Anon. d'Exploitation de Procedes Evaporatories Systeme Prache et Bouillon. December 24, 1918.

137,064. Valerianic Acid and Alkaline Valerianates, Process for the Manufacture of. Soc. Darrasse Freres et Cie., and L. Dupont. December 3, 1918.

137,065. Natural Gas, Process for the Production of Soot-Carbon, Retort Graphite, and other Carbon Products from. Rutgerswerke Akt.-Ges. June 12, 1918.

Patents Court Cases

Announcement is made of the grant of licences by the Public Trustee, under the Trading with the Enemy Acts, 1914 to 1918, to Nicholsons (Newcastle-on-Tyne), Ltd., in respect of the following Patents:—1921/08 (Insoluble condensation products of phenols and formaldehyde); 1922/08 (Impregnation of wood and other fibrous or cellular materials); 21,566/08 (Condensation products, method of making the same); 26,614/11 (Cardboard and method of manufacturing same); 6,293/12 and 6,294/12 (Varnishes and method of preparing same). All the above are in the name of L. H. Backeland. Also 7,284/15 (Dyeing or printing fabrics) in the name of P. M. Justice (*Bakelite Ges.*).

Specifications Accepted, with Date of Application

125,578. Alumina poor in Iron, Process for Producing. Norske Aktieselskab for Elektrokemisk Industri Norsk Industri-Hypotekbank. April 8, 1918.

129,629. Alkali Sulphides, Method for the Production of. E. Bergve. July 8, 1918.

135,815. 135,819 and 135,820. Electro-osmotically removing Liquids from Materials, Apparatus for. Elektro-Osmose Akt.-Ges. (Graf Schwerin Ges.) October 20, 1917.

136,187. Caffeine, Process for Preparing Double Compounds of—with Alkali Salts of Acetyl-Salicylic Acid. H. Sefton-Jones. (*Chemische Fabrik J. A. Wulfing*). January 8, 1918.

136,190. Ammonium Nitrate, Production of. J. R. Partington, G. J. Jones and T. K. Brownson. March 4, 1918.

136,255. Ores, Concentration of. S. Tucker, E. Edser and Minerals Separation, Ltd. December 10, 1918.

136,270. Furnaces. H. Fuller and R. A. Bedford. December 12, 1918.

136,298. Phenol Formaldehyde, Condensation Products. F. J. Robinson and Damard Lacquer Co. December 20, 1918.

136,309. Filters. Continuous Vacuum. A. E. Alexander. (*United Filters Corporation*). December 30, 1918.

136,342. Ammonia, Purification of. C. L. Parsons and L. C. Jones January 20, 1919.

136,356. Gas Furnaces. South Metropolitan Gas Co. and D. Chandler. January 28, 1919.

136,450. Crude Benzols and the Like, Process and Apparatus for the Continuous Distillation and Fractionation of. E. C. R. Marks. (*Soc. Franco-Belge de Fours a Coke*). May 1, 1919.

136,452. Liquid Fuel. E. C. R. Marks. (*U. S. Industrial Alcohol Co.*) May 5, 1919.

136,459. Mineral Dredging, Concentration Plant Particularly Adapted to the Requirements of. W. W. Richardson. May 17, 1919.

136,489. Ethylene Dichloride, Process of Preparing. E. C. R. Marks. (*Union Carbide Co.*) July 2, 1919.

Market Report and Current Prices

Our Market Report and Current Prices are exclusive to THE CHEMICAL AGE, *and, being independently prepared with absolute impartiality by Messrs. R. W. Greeff & Co. and Messrs. Chas. Page & Co., Ltd., may be accepted as authoritative. The prices given apply to fair quantities delivered ex wharf or works, except where otherwise stated. The weekly report contains only commodities whose values are at the time of particular interest or of a fluctuating nature. A more complete report and list are published once a month. The current prices are given mainly as a guide to works managers, chemists, and chemical engineers; those interested in close variations in prices should study the market report.*

Market Report

THURSDAY, January 7.

Markets are recovering most satisfactorily after the holidays, and business is now practically in full swing again. Inquiry both for home trade and for export shows no sign of diminution. Markets are extremely strong, and chemicals almost without exception are in very short supply.

General Chemicals

ACETIC ACID is still firm and is active for both prompt and forward delivery.

ACID CARBOLIC.—The scarcity which we anticipated last week continues, and a distinct shortage is expected over the first half of this year. The price is higher.

ACID FORMIC continues firm and a moderate business is passing, although the high price is against any big business.

ACID OXALIC.—There is still a considerable inquiry for this material, and prices are firmly maintained.

AMMONIUM SALTS.—There is a heavy demand and it is impossible to obtain early delivery.

ARSENIC.—The market is not quite so active but prices are firmly maintained.

BARIUM SALTS.—Chloride has been in active demand and prices very firm.

FORMALDEHYDE.—The spot market is poor and little relief is to be expected from shipments now afloat, as these are all understood to have been earmarked for consumption.

LEAD ACETATE.—The price is considerably firmer with a steady inquiry.

LITHOPONE is very scarce on the spot and higher prices have been paid for parcels now afloat. The material is very scarce in Holland, and much higher prices are being paid for new contracts.

POTASSIUM BICHROMATE.—There is a heavy inquiry for export, and parcels available for early delivery are eagerly snapped up.

POTASSIUM PRUSSIATE.—Owing to delays in arrival of foreign parcels the spot position is rather stringent, and a further advance in price does not seem to be unlikely.

POTASSIUM PERMANGANATE is again in good demand, and a large business has been transacted. Prices are higher.

SODIUM CAUSTIC becomes increasingly scarce and re-sale parcels are few and far between. There is still a heavy demand for export.

SODIUM HYPOSULPHITE is exceedingly firm in price, and there is little or nothing available for early delivery.

SODIUM NITRITE.—The demand for this article is still noticeable. The large export business between foreign makers will undoubtedly jhave the effect of again raising the price.

SODIUM PRUSSIATE.—There is no change in the position, but the article is scarce and the price is firmly maintained. There is a good export inquiry, but in the majority of cases these cannot be met.

ZINC SALTS have received a very steady inquiry, and a moderate business has been done in sulphate.

Coal Tar Intermediates

The market is still very difficult and makers are practically fully sold for the majority of products, especially Beta Naphthol, Alpha Naphthol, Alpha Naphthylamine, &c. Export licences for intermediates and dyes are still suspended, and it is hoped that this will help the manufacturers to cope with the difficulty.

ACETANILIDE.—The market is advancing and it is impossible to obtain reasonable delivery.

ANILINE OIL continues firm, whilst supplies are short.

ANILINE SALT is still firm and unobtainable before April or May delivery.

BETANAPHTHOL.—The price is advancing and all makers are very fully sold.

NAPHTHIONIC ACID.—The market is advancing and supplies are not nearly sufficient to meet the demand.

PARANITRANILINE is unobtainable and the difficulty of obtaining supplies does not appear to diminish.

PARAPHENYLENEDIAMINE is advancing and is in better request.

SALICYLIC ACID.—There has been a decided advance and makers are fully sold for the next few months.

Coal Tar Products

There is little change in the market from last week.

90 per cent. Benzol.—Business has been done at 2s. 1½d. f.o.r. makers' works.

CRESYLIC ACID is still in good demand, and the price is about 3s. 3d. for 97/99 per cent. and 2s. 9d. for 95/97 quality.

CREOSOTE OIL is also very firm, and the price at makers' works is about 7¼d.

NAPHTHALENE is still in good demand, the price for refined being £18 to £20 per ton, and that for crude £8. to £9 per ton.

SOLVENT NAPHTHA is still in the region of 2s. 10d. per gallon.

HEAVY NAPHTHA.—The price to-day is about 2s. 6d. per gallon.

PITCH.—The market is unchanged and the demand remains strong.

Sulphate of Ammonia

The position is unchanged.

Current Prices

Chemicals

	per	£	s.	d.		£	s.	d.
Acetic anhydride	lb.	0	2	9	to	0	3	0
Acetone oil	ton	77	0	0	to	80	0	0
Acetone, pure	ton	90	0	0	to	95	0	0
Acid, Acetic, glacial, 99-100%	ton	85	0	0	to	90	0	0
Acetic, 80% pure	ton	67	10	0	to	70	0	0
Arsenic	ton	65	0	0	to	70	0	0
Boric, cryst.	ton	72	10	0	to	73	10	0
Carbolic, cryst. 39-40%	lb.	0	0	11½	to	0	1	0
Citric	lb.	0	4	3	to	0	4	4
Formic, 80%	ton	110	0	0	to	115	0	0
Gallic, pure	lb.	0	6	6	to	0	6	9
Hydrofluoric	lb.	0	0	7	to	0	0	8
Lactic, 50 vol.	ton	70	0	0	to	72	0	0
Lactic, 60 vol.	ton	85	0	0	to	87	10	0
Nitric, 80 Tw.	ton	37	0	0	to	39	0	0
Oxalic	lb.	0	1	5½	to	0	1	6½
Phosphoric, 1.5	ton	43	0	0	to	45	0	0
Acid, Pyrogallic, cryst.	lb.	0	11	6	to	0	11	9
Salicylic, Technical	lb.	0	2	3	to	0	2	6
Salicylic, B.P.	lb.	0	3	0	to	0	3	6
Sulphuric, 92-93%	ton	7	10	0	to	8	0	0
Tannic, commercial	lb.	0	4	6	to	0	4	9
Tartaric	lb.	0	3	5	to	0	3	6
Alum, lump	ton	19	0	0	to	19	10	0
Alum, chrome	ton	93	0	0	to	95	0	0
Alumino ferric	ton	9	0	0	to	9	10	0
Aluminium, sulphate, 14-15%	ton	15	0	0	to	15	10	0
Aluminium, sulphate, 17-18%	ton	18	10	0	to	19	0	0
Ammonia, anhydrous	lb.	0	1	9	to	0	2	0
Ammonia, .880	ton	32	10	0	to	37	10	0
Ammonia, .920	ton	20	0	0	to	24	0	0
Ammonia, carbonate	lb.	0	0	7½	to		—	

	per	£	s.	d.		£	s.	d.
Ammonia, chloride	ton	70	0	0	to	75	0	0
Ammonia, muriate (galvanisers)	ton	47	0	0	to	50	0	0
Ammonia, nitrate	ton	45	0	0	to	50	0	0
Ammonia, phosphate	ton	115	0	0	to	120	0	0
Ammonia, sulphocyanide	lb.	0	1	10	to	0	2	0
Amyl, acetate	ton	310	0	0	to	315	0	0
Arsenic, white, powdered	ton	65	0	0	to	67	0	0
Barium, carbonate	ton	13	0	0	to	14	0	0
Barium, carbonate, 2- 4%	ton	13	10	0	to	14	10	0
Chlorate	lb.	0	1	3	to	0	1	4
Chloride	ton	22	0	0	to	23	0	0
Nitrate	ton	50	0	0	to	51	0	0
Sulphate, blanc fixe, dry	ton	25	10	0	to	26	0	0
Sulphate, blanc fixe, pulp	ton	15	10	0	to	16	0	0
Bleaching powder, 35-37%	ton	17	10	0	to	18	0	0
Borax crystals	ton	39	0	0	to	40	0	0
Calcium acetate, grey	ton	23	0	0	to	25	0	0
Carbide	ton	28	0	0	to	30	0	0
Chloride	ton	9	0	0	to	9	10	0
Carbon bisulphide	ton	58	0	0	to	59	0	0
Casein, technical	ton	80	0	0	to	83	0	0
Cerium oxalate	lb.	0	3	9	to	0	4	0
Chromium acetate	lb.	0	1	0	to	0	1	2
Cobalt acetate	lb.	0	7	0	to	0	7	6
Oxide, black	lb.	0	7	9	to	0	8	0
Copper chloride	lb.	0	1	3	to	0	1	6
Sulphate	ton	42	0	0	to	43	0	0
Cream Tartar, 98-100%	ton	245	0	0	to	250	0	0
Epsom salts (*see* Magnesium sulphate)								
Formaldehyde 40% vol.	ton	185	0	0	to	195	0	0
Formusol (Rongalite)	lb.	0	4	0	to	0	4	3
Glauber salts	ton	3	10	0	to	3	15	0
Glycerine, crude	ton	70	0	0	to	72	10	0
Hydrogen peroxide, 12 vols.	gal.	0	2	8	to	0	2	9
Iron perchloride	ton	40	0	0	to	42	0	0
Iron sulphate (Copperas)	ton	4	10	0	to	4	15	0
Lead acetate, white	ton	84	0	0	to	86	0	0
Carbonate (White Lead)	ton	59	10	0	to	62	10	0
Nitrate	ton	62	0	0	to	63	0	0
Litharge	ton	50	0	0	to	52	0	0
Lithophone, 30%	ton	48	10	0	to	50	0	0
Magnesium chloride	ton	15	10	0	to	16	10	0
Carbonate, light	cwt.	2	15	0	to	3	0	0
Sulphate (Epsom salts commercial)	ton	13	0	0	to	13	10	0
Sulphate (Druggists')	ton	17	10	0	to	18	0	0
Methyl acetone	ton	89	0	0	to	90	0	0
Alcohol, 1% acetone	gall.	0	11	6	to	0	12	0
Nickel ammonium sulphate, single salt	ton	47	10	0	to	52	10	0
Potassium bichromate	lb.	0	1	6	to	0	1	7
Carbonate, 90%	ton	102	0	0	to	105	0	0
Chloride	ton	Nominal.						
Potassium Chlorate	lb.	0	1	2	to	0	1	3
Meta-bisulphate, 50-52%	ton	250	0	0	to	260	0	0
Nitrate, refined	ton	65	0	0	to	67	10	0
Permanganate	lb.	0	3	9	to	0	4	0
Prussiate, red	lb.	0	6	0	to	0	6	3
Prussiate, yellow	lb.	0	2	0	to	0	2	1
Sulphate, 90%	ton	31	0	0	to	33	0	0
Salammoniac, firsts	cwt.	4	15	0	to		—	
Seconds	cwt.	4	10	0	to		—	
Sodium acetate	ton	50	0	0	to	53	0	0
Arsenate, 45%	ton	50	0	0	to	52	0	0
Bicarbonate	ton	10	10	0	to	11	10	0
Bichromate	lb.	0	0	11	to	0	0	11½
Bisulphite, 60-62%	ton	34	10	0	to	35	10	0
Chlorate	lb.	0	0	6	to	0	0	6¼
Caustic, 70%	ton	27	10	0	to	28	10	0
Caustic, 76%	ton	28	0	0	to	28	10	0
Hydrosulphite, powder, 85%	lb.	0	3	3	to	0	3	6
Hyposulphite, commercial	ton	20	10	0	to	21	0	0
Nitrite, 96-98%	ton	66	10	0	to	69	0	0
Phosphate, crystal	ton	35	0	0	to	37	0	0
Sodium, Perborate	lb.	0	2	2	to	0	2	4
Prussiate	lb.	0	1	2	to	0	1	2½
Sulphide, crystals	ton	16	0	0	to	16	10	0
Sulphide, solid, 60-62%	ton	27	10	0	to	28	10	0
Sulphite, cryst.	ton	11	10	0	to	12	0	0
Strontium, carbonate	ton	85	0	0	to	90	0	0
Nitrate	ton	85	0	0	to	90	0	0
Sulphate, white	ton	8	10	0	to	10	0	0
Sulphur chloride	ton	40	0	0	to	42	10	0
Flowers	ton	24	0	0	to	26	0	0
Roll	ton	23	0	0	to	25	0	0
Tartar emetic	lb.	0	3	4	to	0	3	6
Tin perchloride, 33%	lb.	0	2	6	to	0	2	7
Perchloride, solid	lb.	0	2	9	to	0	3	0
Protochloride (tin crystals)	lb.	0	1	10	to	0	1	11
Zinc chloride, 102 Tw.	per ton	£ 22	s. 0	d. 0	to	£ 23	s. 10	d. 0
Chloride, solid, 96-98%	ton	50	0	0	to	52	10	0
Oxide, 99%	ton	77	10	0	to	80	0	0
Oxide, 94-95%	ton	60	0	0	to	62	10	0
Dust, 90%	ton	70	0	0	to	72	10	0
Sulphate	ton	21	10	0	to	23	0	0
Oxide, Redseal	ton	75	0	0	to	80	0	0

Coal Tar Intermediates, &c.

	per	£	s.	d.		£	s.	d.
Alphanaphthol, crude	lb.	0	3	0	to	0	3	6
Alphanaphthol, refined	lb.	0	3	6	to	0	3	9
Alphanaphthylamine	lb.	0	2	7	to	0	2	9
Aniline oil, drums extra	lb.	0	1	5	to	0	1	6
Aniline salts	lb.	0	1	10	to	0	2	0
Anthracene, 85-90%	lb.	0	1	5	to	0	1	6
Benzaldehyde (free of chlorine)	lb.	0	6	6	to	0	7	0
Benzidine, base	lb.	0	8	0	to	0	8	6
Benzidine, sulphate	lb.	0	6	6	to	0	7	0
Benzoic, acid	lb.	0	5	0	to	0	5	3
Benzoate of soda	lb.	0	5	0	to	0	5	3
Benzyl chloride, technical	lb.	0	2	3	to	0	2	6
Betanaphthol benzoate	lb.	1	6	0	to	1	7	6
Betanaphthol	lb.	0	3	0	to	0	3	6
Betanaphthylamine, technical	lb.	0	6	6	to	0	7	0
Croceine Acid, 100% basis	lb.	0	4	9	to	0	5	0
Dichlorbenzol	lb.	0	0	5	to	0	0	6
Diethylaniline	lb.	0	7	0	to	0	7	6
Dinitrobenzol	lb.	0	1	3	to	0	1	4
Dinitrochlorbenzol	lb.	0	1	3	to	0	1	4
Dinitronaphthaline	lb.	0	1	4	to	0	1	6
Dinitrotoluol	lb.	0	1	7	to	0	1	8
Dinitrophenol	lb.	0	1	3	to	0	1	6
Dimethylaniline	lb.	0	3	3	to	0	3	6
Diphenylamine	lb.	0	3	3	to	0	3	6
H-Acid	lb.	0	12	6	to	0	13	6
Metaphenylenediamine	lb.	0	4	9	to	0	5	0
Monochlorbenzol	lb.	0	0	9	to	0	0	10
Metanilic Acid	lb.	0	7	6	to	0	8	6
Monosulphonic Acid (2:7)	lb.	0	7	0	to	0	8	0
Naphthionic acid, crude	lb.	0	3	6	to	0	3	9
Naphthionate of Soda	lb.	0	4	3	to	0	4	6
Naphthylamin-di-sulphonic-acid	lb.	0	4	6	to	0	5	0
Nitronaphthaline	lb.	0	1	3	to	0	1	4
Nitrotoluol	lb.	0	1	3	to	0	1	6
Orthoamidophenol, base	lb.	0	18	0	to	1	0	0
Orthodichlorbenzol	lb.	0	1	1	to	0	1	3
Orthotoluidine	lb.	0	2	2	to	0	2	3
Orthonitrotoluol	lb.	0	1	6	to	0	1	9
Para-amidophenol, base	lb.	0	14	0	to	0	15	0
Para-amidophenol, hydrochlor	lb	0	15	6	to	0	16	0
Paradichlorbenzol	lb.	0	0	4	to	0	0	5
Paranitraniline	lb.	0	4	0	to	0	4	6
Paranitrophenol	lb.	0	2	9	to	0	3	0
Paranitrotoluol	lb.	0	5	3	to	0	5	6
Paraphenylenediamine, distilled	lb.	0	12	0	to	0	13	0
Paratoluidine	lb.	0	7	0	to	0	7	6
Phthalic anhydride	lb.	0	9	6	to	0	10	6
R. Salt, 100% basis	lb.	0	5	0	to	0	5	6
Resorcin, technical	lb.	0	11	0	to	0	12	0
Resorcin, pure	lb.	0	17	6	to	1	0	0
Salol	lb.	0	4	9	to	0	5	6
Shaeffer acid, 100% basis	lb.	0	4	0	to	0	4	6
Sulphanilic acid, crude	lb.	0	1	6	to	0	1	8
Tolidine, base	lb.	0	12	0	to	0	12	6
Tolidine, mixture	lb.	0	2	9	to	0	3	0

Miscellaneous and Paint Materials

		£	s.	d.		£	s.	d.
Barytes	ton	11	0	0	to	13	0	0
Casein	ton	75	0	0	to	80	0	0
Chalk, precipitated (light)	ton	20	0	0	to	24	0	0
Chalk, precipitated (heavy)	ton	10	0	0	to	12	0	0
China clay (bags extra) (f.o.r. Cornwall)	ton	1	12	6	to	3	12	6
Coke, blast furnace (S. Wales)	ton	2	12	6	to	3	0	0
Coke, foundry	ton	3	5	0	to	3	10	0
Fuller's Earth	ton	4	0	0	to	5	0	0
Lead, litharge flake	ton	52	10	0	to	53	10	0
Lead, red	cwt.	2	10	0	to	2	12	6
Lead, white	cwt.	3	0	0	to	3	2	6
Ultramarine	ton	90	0	0	to	110	0	0
Prussian Blue	cwt.	11	0	0	to	11	10	0
Chrome green	cwt.	6	5	0	to	6	10	0
Chrome yellow	cwt.	6	5	0	to	7	0	0
Mineral black	ton	10	0	0	to	12	0	0
Carbon black	lb.	0	1	3	to	0	1	6
Guignet's Green, 30%	lb.	0	1	5	to	0	1	6

Building Materials

	per	£	s.	d.		£	s.	d.
Bricks, stock	1000	4	4	6	to	4	6	0
Bricks, blue Staffs.	1000	9	10	0	to	9	11	0
Firebricks, Stourbridge	1000	10	9	0	to	10	10	0
Fireclay, Stourbridge	ton	2	2	0	to	2	4	0
Glass, sheet, 21 oz.	ft.	0	0	8½	to	0	0	8¾
Lime, ground blue Lias	ton	2	16	0	to	2	17	0
Lime, grey stone	ton	3	0	0	to	3	2	6
Linseed oil, boiled	gall.	0	10	3	to	0	10	6
Linseed oil, raw	gall.	0	10	6	to	0	11	0
Portland cement	ton	3	13	6	to	3	15	6
Slates, Bangor	1200	32	10	0	to	36	0	0
Slates, Portmadoc	1200	19	0	0	to	23	0	0
Tiles	1000	6	3	0	to	6	5	0
Turpentine	gall.	0	12	6	to	0	12	9
Yellow Pine, up to 3×8	standard	42	0	0	to	48	0	0
Yellow Pine, over 3×8	standard	44	0	0	to	53	0	0

The following prices are furnished by Messrs. Miles, Mole & Co., Ltd., 101, Leadenhall Street, London, E.C.

Metals and Ferro-Alloys

	per	£	s.	d.		£	s.	d.
Aluminium, 98-99%	ton	150	0	0	to	151	0	0
Antimony, English	ton	48	0	0	to	49	0	0
Copper, best selected	ton	125	0	0	to	126	0	0
Ferro Chrome, 60%	ton	56	0	0	to	57	0	0
Manganese, 76-80%	ton	27	0	0	to	28	0	0
Silicon, 45-50%	ton	26	0	0	to	27	0	0
Tungsten, 75-80%	lb.	0	3	0	to	0	3	6
Lead Ingot	ton	48	5	0	to	49	0	0
Sheets	ton	56	0	0	to	57	0	0
Nickel, 98-99%	ton	220	0	0	to	225	0	0
Tin	ton	364	0	0	to	365	0	0
Zinc Sheet	ton	80	0	0	to	85	0	0
Spelter	ton	60	0	0	to	60	10	0

Structural Steel

Angles and Tees	ton	23	0	0	to	23	10	0
Flats and rounds	ton	21	10	0	to	22	0	0
Joists	ton	18	15	0	to	19	0	0
Plates	ton	22	0	0	to	24	0	0
Rails, heavy	ton	18	0	0	to	19	0	0
Sheets, 24G	ton	30	0	0	to	32	0	0
Gald. Corrd. Sheets	ton	48	0	0	to	49	0	0

Chemical Trade of the]Year

SIR S. W. ROYCE & CO., LTD., of Manchester, in reviewing the chemical trade of the past year, state :—" This years' trading has been satisfactory and especially so during the later months, though handicapped by difficulties brought about by the war. A year ago there were still a good number of restrictions on commerce, but these, with some few exceptions, have gradually been removed. Labour unrest has been a marked feature of the year, caused no doubt to a large extent by the continual rise in the cost of living, and the frequent strikes and threatened strikes have much interfered with production by curtailing supplies of fuel and other essentials. The difficulties and delays in inland transport have been a source of anxiety all the year, but have been much increased since the great strike on the railways at the end of September, and the position remains a serious one. Shipping facilities have gradually improved, but rates of freight have remained high, and the oversea trade continues much hampered by the congestion at the ports, and also by the course and fluctuations of the rates of foreign exchange. In spite of these drawbacks, the volume of inquiry and the business done both for home and export have steadily increased, and the outlook for the new year is encouraging. Prices of many products have fallen considerably from the figures quoted at the beginning of the year, and the lower level of values has given more confidence to consumers, and materially contributed to the good business which has been passing. During the last few months the values of many products have again shown an upward tendency and manufacturers are disinclined to sell far forward until they see their way more clearly in regard to supplies of raw material, fuel, &c.

"Chemical Age"

Our American contemporary "Chemical Age" of New York has resumed publication after a stoppage of nearly two months in consequence of the New York printers' strike.

Visit to Chemical Manure Works

BY invitation of Major J. W. Bickers Stephenson, the agricultural students of Armstrong College recently visited Stephenson's Chemical Manure Works at St. Peter's, Newcastle. Most of the visitors are studying agriculture at the college, and were accompanied by Mr. S. H. Collins, adviser in agricultural chemistry. The students were met at the works by Mr. Straughan, the general manager, who conducted them to the bone department, where a special process was examined for the extraction of fat by benzine from pure bones before they are sold as bone meal or to be manufactured into dissolved bones. It was explained that the bones were broken by heavy crushers and then carried by means of an endless elevator into a vertical cylinder, into which supplies of benzine were run at regular intervals. The benzine was heated by a steam coil, and the hot benzine extracted the fat and moisture from the bones. The fat and hot water were run off into another cylinder and treated with steam to drive off any benzine remaining in the fat. After further treatment, the fat was run into barrels and sold for the manufacture of soap, &c. The benzine is recovered by distillation and condensation. Subsequently the visitors inspected stocks of Uafsa phosphate, the mills used for grinding and the plant which mixed the sulphuric acid and ground raw phosphate. In a special machine the raw phosphate is mixed with a supply of sulphuric acid, and the mixture run out in a more or less liquid state into stone dens, where, after chemical action, it sets into a bread-like mass, and assumes a dry, spongy appearance. In this process the insoluble phosphate of lime is converted into water-soluble phosphate—a most valuable change. After the superphosphate is sufficiently dried it is thoroughly screened ; the finished product is either sent separately to the farmers or used as a basis for the compound manures mixed by the firm for the various farm crops. During their visit to the works the students saw the whole process of manufacture of the superphosphates and how they were incorporated and thoroughly mixed with other manures, like Kainit, sulphate of potash, sulphate of ammonia, steamed bone flour and bone meal to make compound manures. At the close of the visit Mr. Straughan was cordially thanked by the students.

Catalogues Received

FILTER PAPERS.—A detailed price list and separate booklet, containing 22 illustrations and descriptions of Whatman filter papers in various grades, extraction thimbles, folded filters, drop reaction papers, absorption blocks, filter cones, diffusion shells, arsenic test strips, and fat-free strips for determining fat in milk by the Adams coil method. A page is allotted to each article, and the descriptions include the process of manufacture and the method to which each article is specially applicable. The booklet is printed on Whatman hand-made paper, and the cover is a specimen of Whatman drawing paper.—W. & R. Balston, Ltd., Maidstone. Pp. viii.+30.

FILTER PAPERS.—A concise price list of circular filter papers, folded circles, Soxhlet thimbles and cheap machine-made papers. An index indicating the uses and application of the various specialities, and a table giving the weight of ash of hand-made filter circles are provided.—J. Barcham Green & Son, Maidstone. Pp. 12.

BOOKS.—A long list of current scientific books and periodicals, including journals of scientific societies. The lists are grouped under following headings : Chemistry, Chemistry Applied to Arts and Manufactures, Agriculture and Agricultural Chemistry. These groups are again subdivided into numerous categories, arranged alphabetically and indexed.—William Bryce, Edinburgh. Pp. 52.

Census of Production in 1921

THE Board of Trade has issued an order, dated December 22, 1919, determining that a Census of Production shall be taken for the following trades or businesses in the year 1921 :—Coal and ironstone mines under the Coal Mines Regulation Acts ; coke works at collieries ; oil shale mines and oil shale works ; iron mines under the Metalliferous Mines Regulations Act and iron quarries ; salt mines, brine pits, and salt works ; iron and steel trades (smelting, rolling and founding) ; tinplate trade ; galvanised sheet trade ; copper, brass, lead, tin, zinc and other metal trades (except the gold and silver refining trade) ; bleaching, dyeing, printing and finishing trades ; sugar and glucose trades ; brewing and malting trades ; spirit-distilling trades ; chemicals, coal-tar products and drug trades ; seed-crushing trade ; fertiliser trade ; soap and candle trades ; leather trade (tanning and dressing) ; brick and fireclay trades ; china and earthenware trades ; cement trade ; gas undertakings. The Board has further determined that returns for the Census shall not be required from persons, companies, or firms who did not employ on the average more than five persons, exclusive of officers of the company or members of the firm, during the calendar year 1920, provided that each such person, makes a signed declaration, of the average number of persons employed by them inside or outside the establishment during such year.

Company News

RECKITT & SONS.—Interim dividend of 6d. per share on Ordinary shares.

ROYAL DUTCH PETROLEUM CO.—Interim dividend for 1919 15 per cent., payable Jan. 22, at exchange of the day on Amsterdam.

AFRICAN SALTPETRE.—Accounts for the year to September 30 last show balance at debit of profit and loss account of £20,359.

MAJUNGA OILFIELDS OF MADAGASCAR.—£50,000 ordinary shares of £1 each at par offered, constituting part of authorised capital of £200,000.

LIMMER & TRINIDAD LAKE ASPHALT CO.—Directors have decided to offer 20,000 preference shares of £1 to shareholders at par in proportion to their holdings.

YORKSHIRE DYEWARE & CHEMICAL.—Interim dividend of 5 per cent., less tax, on ordinary shares for half-year, has been paid. Last year, 10 per cent.

PETROLEUM EXPLORATION & TRINIDAD NATIONAL PETROLEUM COMPANIES.—Combination arranged. Shareholders of former to receive two £1 shares in Trinidad Co. for each of their £1 shares.

DORMAN, LONG & CO.—Acquired works of Carlton Iron Co., whose possessions include ironworks at Stillington, Durham, consisting of three blast furnaces, together with up-to-date coke oven and by-products plant, and a colliery.

BATU CAVES RUBBER.—A resolution is to be considered on January 12, which proposes to form a new company, under the same title. Capital to be £216,000 in £1 shares. Eight fully-paid shares in new company to be issued to existing shareholders for each share at present held.

EBBW VALE STEEL AND IRON WORKS.—Operations resumed Monday last, after being closed for over five months, following a strike of skilled workmen. The loss incurred by the company as a result of the stoppage is £250,000, while a similar amount was lost by the workmen directly affected.

NIGERIAN TIN CORPORATION.—Net profit for year ended March 31 last £4,069, which, added to balance of £7,116 brought forward, makes a total of £11,185. After deducting the interim dividend of 7½ per cent., and directors' extra remuneration, there is a balance of £4,920, which it is proposed to carry forward, but to pay an interim dividend of 10 per cent. on account of the current year.

SUNGEI RINCHING RUBBER.—A scheme of reconstruction is to be considered on January 12 and 28. It is proposed to form a new company under the title of the Sungei Rinching Rubber Estates, Ltd., with a capital of £200,000, in £1 shares. Shareholders in the present company will be entitled to four fully-paid shares in the new company for every £1 share now held, together with 3s. per share in cash.

KAWIE (JAVA) RUBBER ESTATES.—After allowing £1,417 for depreciation, profit for the year is £23,938, and £14,808 brought in, making a total of £38,746. Deduct £6,422 reserve for Dutch Income Tax, and £5,000 for excess profits duty, leaving available balance £27,324. Further dividend of 15 per cent. recommended, less tax, making 20 per cent. for the year. For general purposes of the company the directors propose to offer the shareholders one share in 10 at a premium of 4s. per share out of the unissued capital.

BRITISH BURMAH PETROLEUM.—Profit for the year ended July 31, £534,603. £25,634 has been added to surplus, making an available balance of £433,720. The balance of profit for the year is £131,432. Dividend for the year of 18. per share, free of tax, on all shares issued prior to July 31 last is proposed, making a total dividend of 17½ per cent. free of tax, for the year (against 12½ per cent.), on the total issued share capital as at July 31 last. £67,579 has been written off this year for depreciation, £26,934 of which is allocated to refinery accounts and £40,644 to field accounts.

CYPRUS OIL TRUST.—At the annual ordinary general meeting of the Cyprus Oil Trust, Ltd., in London, on December 31, Mr. Thomas Bremner, who presided, referred to the oil leases recently acquired in Roumania. The company's oil-bearing lands comprised 2,500 acres, situated in one of the best districts in Roumania, with all reasonable facilities near, and the Board was formulating the policy for the active development of the leases. A deed of cession had been executed by the vendor and steps were being taken to send a translation, which had been legalised at the Roumanian Legation here, to Roumania, in order that the oil rights might be transferred into the company's name as speedily as possible. Mr. E. G. Boxshall, a British subject resident in Bucharest, had been appointed general agent and power of attorney. The company had a substantial cash balance in hand, sufficient to provide for the thorough testing of the land. They had been approached by a responsible group desirous of taking over one of their Roumanian oil leases. This group proposed to spend a considerable sum in drilling, and, if satisfactory results were obtained, to form a separate company, giving the Trust a very large share interest in it free of charge. Full details had not been settled, but there was a very large area of oil country to prove, and such an arangement should be of great help and profit to the company.

Stocks and Shares

Commercial, Industrial, &c.

	Quotations Dec. 31	Quotations Jan. 7.
Alby United Carbide Factories, Ord....	11/16–13/16	13/16–15/16
Associated Portland Cement Manufrs. (1900) Ltd., Ord.	26/6–27/5	26/3–27/3
Bell's United Asbestos Co., Ltd., Ord.	1 13/16–2 1/16	1 7/8–2 1/8
Bleachers' Association, Ltd., Ord.	2 7/16–2 9/16	2 7/16–2 9/16
Borax Consolidated, Ltd., Prefd. Ord.	3 7/8–4 3/8	3 7/8–4 3/8
Bradford Dyers' Assoc. Ltd., Ord.	2 15/16–3 1/16	3 3/16–3 5/16
British Aluminium Co., Ltd., Ord.	1 11/16–1 13/16	1 23/32–1 25/32
British Oil and Cake Mills, Ltd., Ord	1 15/16–2 1/16	1 15/16–2 1/16
British Portland Cement Manufrs., Ltd., Ord.	30/0–32/0	30/0–32/0
Brunner, Mond & Co., Ltd., Ord.	2 1/8–2 1/4	2 3/16–2 5/16
Castner-Kellner Alkali Co., Ltd.	3 3/16–3 5/16	3 5/16–3 7/16
China Clay Corporation, Ltd., Ord.	1/4–3/8	1/4–3/8
Cook (Edward) & Co., Ltd., 4% 1st Mort. Deb. Stock Red.	57–61 xd	57–61 xd
Courtaulds, Ltd.	7–8	7–8
Crosfield (Joseph) & Sons, Ltd., Cum. 6% Prefce	3/4–3 1/4 xd	3/4–3 1/4 xd
Curtis's & Harvey, Ltd. 4½% 1st. Mort. Deb. Stk. Red.	69-71	69–71
Electro Bleach & By-Products Ltd., Ord.	21/0	15/0
Explosives Trades, Ltd., Ord	21/6–22/6	22/0–23/0
Field (J. C. & J.), Ltd., Ord	1 1/8–1 3/8	1 3/8–1 5/8
Greenwich Inlaid Linoleum (Fredk. Walton's New Patents) Co., Ltd., Ord.	3/8–3/4	3/8–3/4
Harrison & Crosfield, Ltd., Prefd. Ord.	1 1/4–1 3/8 xd	1 1/4–1 3/8 xd
India Rubber, Gutta Percha & Tel. Wks. Co., Ltd., Ord	16 3/4–17 3/4 xd	16–17 xd
Lawes' Chemical Manure Co., Ltd., Ord.	4 1/2–5 1/2	4 3/4–5 3/4
Lever Bros., Ltd., 6% Cum. "A" Prefce	18/9–19/6 xd	18/3–19/0 xd
Do. 6½% Cum. "B" Prefce	19/6–20/3 xd	19/6–20/3 xd
Magadi Soda Co., Ltd., Ord	20/6–21/6	20/6–21/6
Manganese Bronze & Brass Co., Ltd., Ord.	11/16–13/16	5/8–3/4
Maypole Dairy Co., Ltd., Defd. Ord.	7/8–1	7/8–1
Mond Nickel Co., Ltd., 7% Cum. Pref.	1 1/16–1 1/8	1 1/16–1 3/16
Do. 7% Non. Cum. Pref.	7/8–1	7/8–1
Pacific Phosphate Co., Ltd., Ord.	4 1/2–4 3/4 xd	4 5/8–4 7/8 xd
Power-Gas Corporation, Ltd., Ord	11/16–13/16 xd	11/16–13/16 xd
Price's Patent Candle Co., Ltd.	91–96	91–96
Salt Union, Ltd., Ord.	1 9/16–1 11/16	1 13/32–1 15/32
United Alkali Co., Ltd., Ord.	1 3/8–1 5/8	1 9/16–1 11/16
Val de Travers Asphalte Paving Co., Ltd.	3/4–1	3/4–1
Van den Berghs, Ltd., Ord.	3 9/16–3 13/16	3 5/8–3 7/8
Walkers, Parker & Co., Ltd.	1 1/8–1 1/4	1 1/8–1 1/4
Welsbach Light Co., Ltd.	2–2 1/4	2–2 1/4

Gas, Iron, Coal and Steel

Armstrong (Sir W. G.) Whitworth, Ltd., Ord.	1 23/32–1 25/32	35/0–36/0
Ebbw Vale Steel, Iron & Coal Co., Ltd., Ord.	25/6–26/6	1 5/16–1 7/16
Gas Light & Coke Co., Ordinary Stock (4% Stand.)	56–59	56–59
Hadfield's, Ltd., Ordinary	1 15/16–2	2–2 1/4
South Metropolitan Gas Co., Ordinary (4% Stand.)	56–59	56–59
Staveley Coal & Iron Co., Ltd., Ord.	1 11/16–1 13/16	1 3/4–1 7/8
Vickers, Ltd., Ordinary	32/6–336	35/9–36/9

Mines, Nitrate, &c.

Anglo-Chilian Nitrate and Rly. Co., Ltd., Ord.	15 1/4–15 3/4	16–17
Antofagasta Nitrate Co. Compañia de Salitres de Antofagasta) 5½% 1st. Mt. Debs. Red.	85–90	85–90
Lagunas Nitrate Co., Ltd.	1–1 1/4	1 3/8–1 3/8
Rio Tinto Co., Ltd., Ord. (Bearer)	45–47	49–51
Tarapaca & Tocopilla Nitrate Co., Ltd.	14/0–16/0	17/0–18/0

Oil and Rubber

Anglo-Java Rubber & Produce Co., Ltd.	7/9–8/3	7/9–8/3
Anglo-Maikop Corporation, Ltd., Ord.	5/16–7/16	5/16–7/16
Anglo-Malay Rubber Co., Ltd.	14/6–15/0	14/7½–15/1½
Anglo-Persian Oil Co., Ltd., Cum. 6% Part	1 7/32–1 11/32	1 7/32–1 11/32
Burmah Oil Co., Ltd., Ord.	18 7/8–19 1/8	19 1/8–19 3/8
Chersonese (F.M.S.) Estates, Ltd.	4/4½–4/7½	4/3–4/6
Linggi Plantations, Ltd., Ord.	3 1/2–3 3/8	3 7/16–3 9/16
Mexican Eagle Oil Co., Ltd. (Cia. Mexicana de Pet. "El Aguila" S.A.) Ordinary (Bearer)	10 3/4–11	10 3/4–11
"Shell" Transport & Trading Co., Ltd., Ord.	10 15/16–11 3/16	11 1/8–11 3/8
Do. 5% Cum. Pref.	8 1/2–9	8 1/2–9

Commercial Intelligence

The following are taken from printed reports, but we cannot be responsible for any errors that may occur.

London Gazette

Partnerships Dissolved

ANTHONY, THOMAS VAUGHAN, and BATH, HENRY, both of London; WILLIAMS, JOHN WALTERS, of Swansea; WEIR, JOHN GARLAND, and ANTHONY, HENRY VAUGHAN, of London; and MORRICE, EDWARD WEBSTER, late of Liverpool, and now of London, carrying on in London, Liverpool and Swansea, business as metal and nitrate brokers, &c., under the style of Henry Bath & Son, by mutual agreement as on December 31, 1919, Henry Bath retiring as on that date. The business will be carried on partly by the remaining partners under the same firm, who will discharge all the liabilities of the late firm and collect their book debts, and partly by a private company, under the style of Henry Bath & Son, Ltd., established under the Companies Acts, 1908 to 1917, of which all the continuing members will be members.

KING, HERBERT EDMUND, PRESTON, ALFRED CHARLES, and PRESTON, HERBERT CLASSON, wholesale druggists, 262, Bishopsgate, and 26½, Duke Street, London, under the style of Thos. Hodgkinson, Prestons & King, by effluxion of time, December 31, 1919. All debts received and paid by Alfred Charles Preston, Herbert Classon Preston, and William James Beardsley, who will continue the business under the same style.

Notice of Dividend

THE BRITISH SALICYLATES, LTD., 90 & 92, Banner Street, Golden Lane, London. 7$\frac{15}{16}$d. first and final. Any day (except Saturday) between 11 and 2, at the office of the Official Receiver and Liquidator, 33, Carey Street, Lincoln's Inn, London, W.C.2.

Companies Winding Up Voluntarily

ENGLISH MARGARINE WORKS, LTD.—Liquidator, Mr. Herbert Bowler.

GHIZELA NITRATE CO., LTD. (in voluntary liquidation).—Meeting of creditors at the offices of the Company, 27, Leadenhall Street, London, E.C.3, on Monday, January 19, at 12 noon. Creditors' claims on or before February 26 to W. J. Welch, 27, Leadenhall Street, London, E.C.3, Liquidator.

THE PORT TENNANT CHEMICAL CO., LTD.—Liquidator, Mr. Hubert Fergusson, of Salisbury House, E.C.

Mortgages and Charges

[*NOTE.—The Companies Consolidation Act, of* 1908, *provides that every Mortgage or Charge, as described therein, created after July* 1, 1908, *shall be registered within* 21 *days after its creation, otherwise it shall be void against the liquidator and any creditor. The Act also provides that every Company shall, in making its Annual Summary, specify the total amount of debts due from the Company in respect of all Mortgages or Charges which would, if created after July* 1, 1908, *require registration, The following Mortgages and Charges have been so registered. In each case the total debt, as specified, in the last available Annual Summary, is also given—marked with an *—followed by the date of the Summary, but such total may have been reduced since such date.*]

Satisfactions

BRYANT & MAY, LTD., LONDON, E.—Satisfaction registered December 23, for £400, part of £250,000, registered February 18, 1903.

CARGO FLEET IRON CO., LTD., MIDDLESBROUGH.—Satisfaction registered December 29, for £216,700, part of £500,000, registered October 10, 1905.

EXPANDED METAL CO., LTD (formerly NEW EXPANDED METAL CO., LTD.), LONDON, E.C.—Satisfaction registered December 22, £21,500, balance of amount registered February 26, 1901.

MELTHAM SILICA FIRE BRICK CO., LTD., SHEFFIELD.—Satisfaction registered December 22, for £200, part of £1,000, registered June 19, 1909.

TYCE COPPER CO., LTD., LONDON, E.C.—Satisfaction registered December 23, £20,000, registered January 31, 1913.

County Court Judgment

[*NOTE.—The publication of extracts from the "Registry of County Court Judgments" does not imply inability to pay on the part of the persons named. Many of the judgments may have been settled between the parties or paid. Registered judgments are not necessarily for debts. They may be for damages or otherwise, and the result of bona-fide contested actions. But the Registry makes no distinction of the cases. Judgments are not returned to the Registry if satisfied in the Court books within twenty-one days. When a debtor has made arrangements with his creditors we do not report subsequent County Court judgments against him.*]

GRAINGER, W., 6, St. Martin's Court, Newgate Street, Newcastle-on-Tyne, chemist. £13. 2s. November 21, 1919.

New Companies Registered

The following list has been prepared for us by Jordan & Sons Ltd., Company Registration Agents, 116 and 117, Chancery Lane London W.C.:—

ADCOCKS LIMITED, Drayton Park Works, Highbury, N.5.—Oil and grease refiners. Nominal Capital, £10,000 in 10,000 shares of £1 each. Directors: C. C. Miller, 12, Dowgate Hill, E.C.4; D. C. Miller, The Lindens, Hartingdon Road, Chiswick, W. Qualification of Directors, £100. Remuneration of Directors, £50 each.

BALTIC CHEMICAL CO., LTD., 42, Copthall Avenue, E.C.—Dealers in chemicals and dye woods. Nominal Capital, £6,000 in 6,000 shares of £1 each. Directors: N. Rottenberg (Governing Director). Qualification of Directors, one share.

BATH (HENRY) & SON, LTD.—Merchants in metals, minerals, nitrate of soda, chemical products and fertilisers. Nominal Capital, £50,000 in 50,000 shares of £1 each. Directors: T. V. Anthony, 14, Daleham Gardens, Hampstead, N.W. (Governing Director); H. V. Anthony, South Hangelm, Oxted, Surrey; E. W. Morrice, 16, Vale Avenue, Chelsea, S.W.3; and three others. Qualification of Directors, one share.

BAY TRADERS, LTD., 8, Fenchurch Buildings, E.C.3.—Manufacturers of rosin, turpentine and all by-products. Nominal Capital, £2,000 in 2,000 shares of £1 each. Directors: W. Foden, Elgin Lodge, Woodhurst Park, New Oxted, Surrey; H. E. Gibbs, 123, Revelstoke Road, Wimbledon, S.W.18. Qualification of Directors, one share.

CARRERAS (A. & E.), LTD.—Manufacturers of soaps, &c. Nominal Capital, £101,000 in 100,000 Preference shares and 1,000 Ordinary shares of £1 each. Directors: To be appointed by subscribers. Qualification of Directors, £250. Remuneration of Directors, to be voted by Company in General Meeting. Subscribers: A. Carreras, 207, King Street, Hammersmith, W.6; E. Carreras, 38A, Putney Hill, S.W.15.

ENSENADA SYNDICATE, LTD., Hastings House, 10, Norfolk Street, Strand, W.C.2.—To win ore, metal, oil and mineral substances of all kinds. Nominal Capital, £20,000 in 19,000 Ordinary shares of £1 and 20,000 Deferred shares of 1s. each. Directors: To be appointed by subscribers. Qualification of Directors, £100.

GUILDHALL INDUSTRIAL DEVELOPMENT, LTD.—To acquire and carry on the business of treating and dealing with crude and refined oils and sulphate of ammonia. Nominal Capital, £1,000. in 990 Ordinary shares of £1 and 200 Management shares of 1s; each. Directors: H. Tivey, 23, Waldeck Road, West Ealing. W. Riches, 46, Pepys Road, Wimbledon, S.W.19. Qualification of Directors, 50 shares.

HOWARDS & SONS, LTD., Uphall Works, Ilford.—Manufacturing chemists, druggists, drysalters and oil and colourmen. Nominal Capital, £250,000 in 250,000 shares of £1 each. Directors: C. F. Howard, A. G. Howard, D. L. Howard, B. F. Howard, G. E. Howard. Qualification of Directors, 5,000 shares.

JACKSON (THOMAS S.) & SONS, LTD., Corner Wharf, Olmar Street, Malt Street, Old Kent Road, S.E.—Varnish, paint, wood stain and floor polish manufacturers. Nominal Capital, £40,000 in 15,000 Preference shares and 25,000 Ordinary shares of £1 each. Directors: C. S. Jackson, Suffolk House, Duppers Hill, Croydon (Chairman); R. F. Jackson, 18, St. Augustines Avenue, Croydon; C. R. Jackson, 23, Warrington Road, Croydon. Remuneration of Directors: C. S. Jackson, £500; R. F. Jackson, £480; C. R. Jackson, £360.

KEMBALL, BISHOP & CO., LTD.—Manufacturing chemists and druggists. Nominal Capital, £400,000 shares of £1 each. Directors to be appointed by subscribers. Qualification of Directors, £2,000. Remuneration of Directors, £250 each; Chairman, £350. Subscribers: A. C. Bishop, 61, Rutland Gate, S.W.7; E. Herbert, Ludford House, Duppas Hill, Croydon

MASSON, SEELEY & CO., LTD., 121, Victoria Street, S.W.1.—Chemical engineers and analytical and consulting chemists. Nominal Capital, £10,000 in 5,000 Preference shares of £1 and 5,000 Ordinary shares of £1 each. Directors: G. S. Walpole, The Meade, Beaconsfield, Bucks; W. Brumwell, 105, Greencroft Gardens, Hampstead, N.W.6. Qualification of Directors, £100. Remuneration of Directors, £300 to be divided.

MAXWELL, F. P. & CO., LTD.—Margarine and edible fat manufacturers. Nominal Capital, £10,000 in 2,000 shares of £5. Directors: J. Greenhalgh, Castelrigg, Preston Hill, Birkenhead: F. Greenhalgh, 16, Cambridge Street, Hickbridge. Qualification of Directors, £100.

MICKLEY COKE, BY-PRODUCT & CHEMICAL CO., LTD.—Manufacturers and dealers in coke, bricks, tiles and other clay goods, benzol, sulphate of ammonia, &c. Nominal Capital, £250,000 in 250,000 shares of £1 each. Directors: E. Liddell, Stillington Hall, Easingwold, Yorkshire; C. Liddell, Warwick Hall, Wetheral, Cumberland; C. Cookson. Qualification of Directors, £1,000. Remuneration of Directors, £500 to be divided.

NATIONAL DYES, LTD.—Manufacturers of dyes. Nominal Capital, £350,000 in 100,000 Preference shares and 250,000 Ordinary shares of £1 each. Minimum subscription, 7 shares.

Directors to be appointed by subscribers. Qualification of Directors, £1,000. Remuneration of Directors, £150 each. Subscribers: P. W. Evennett, 30, St. Aubyn's Road, Upper Norwood, S.E.; J. Bannister, 26, Algernon Road, Lewisham, S.E., and five others.

NATIONAL OILFIELDS, MINING & REFINING CO., LTD., 15, Angel Court, E.C.2.—To acquire mines and oil bearing lands and turn same to account. Nominal Capital, £1,000 in 2,000 shares of 10s. each. Directors: To be appointed. Remuneration of Directors, £150 each.

NATIONAL UNION OIL CO., LTD.—To search for and win oils, shale, minerals and natural gas of all kinds. Nominal Capital, £300,000 in 600,000 shares of 10s. each. Minimum subscription, 7 shares. Directors to be appointed by subscribers. Qualifications of Directors, 100 shares. Remuneration of Directors, £250 each; Chairman, £350. Subscribers: N. Doe, 86, Carlton Vale, N.W.6; N. K. Newman, 62, Blenheim Gardens, Wallington, and five others.

NORTH STAFFORD PRODUCTS, LTD.—Manufacturers of margarine and other butter substitutes. Nominal Capital, £5,000 in 5,000 shares of £1 each. Directors to be appointed by subscribers. Qualification of Directors, 1 share. Remuneration of Directors to be voted by Company in General Meeting. Subscribers: G. S. White, Elmhurst, Woore, Salop; G. R. White, Durban House, Vine Street, Stoke-on-Trent.

OSSETT CARBONISING CO., LTD.—To carry on the business of commission carbonisers. Nominal Capital, £10,000 in 10,000 shares of £1 each Directors: J. E. Halstead; H. Wade, Grange View, Wesley Street, Ossett; F. Smith, "Lea Royal," Ossett; G. Teatle. Qualification of Directors, 250 Ordinary shares. Remuneration of Directors, £2,000 to be divided.

PORT TALBOT PURE ICE & COLD STORAGE CO., LTD., 14, Courtland Terrace, Port Talbot, Glam.—Ice manufacturers and cold storage proprietors. Nominal Capital, £15,000 in 15,000 shares of £1 each. Directors: R. Hopkins, 71, Water Street, Aberavon; J. Cox, Pen Ton, Port Talbot; L. Belle, 6, Plough Terrace, Port Talbot; A. E. A. Clark, Vivian Hotel, Aberavon; J. Tricker, Courtland Terrace, Port Talbot. Qualification of Directors, £250.

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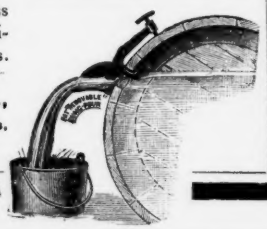

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